Service Guide

Z-130 PC Series
Z-140 PC Series

585-146-1

860-131-1

ZENITH data systems

The purpose of this page is to make sure that all service bulletins are entered in this service guide. When a service bulletin is received, mark the guide and list the information in the record below.

Record of Field Service Bulletins

SERVICE BULLETIN NUMBER	DATE OF ISSUE	CHANGED PAGE(S)	PURPOSE OF SERVICE BULLETIN	INITIALS

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St. Joseph, Michigan 49085

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Chapter 1

Introduction and General Information

This service guide is intended to aid the service technician in rapidly repairing or installing a Z-130 PC Series or Z-140 PC Series computer at the customer's location. This guide provides information to service the computer to the circuit board or subassembly level only.

An abbreviated installation procedure is contained in this guide to provide concise information to install these computers. If you are totally unfamiliar with this series of computers, you should refer to the other publications listed below in addition to this service guide.

Basic operating instructions are also provided to aid the service technician who is not familiar with these computer models.

Related Publications

860-124	*Z-140 PC Series Parts Lists and Schematics*
860-147	*Z-130 PC Series Parts Lists and Schematics*
595-3393	*Z-140 PC Series Owner's Manual*
595-3444	*Z-130 PC Series Owner's Manual*
595-3441	*Z-140 PC Series Technical Reference Manual*

The Technical Reference Manual pertains to both the Z-130 PC Series and the Z-140 PC Series computers. Options and peripheral equipment for these computers have separate manuals which are not listed here.

List of Tools and Equipment

The tools and equipment needed to service this equipment in accordance with this service guide are:

1 slotted screwdriver
1 #2 phillips-head screwdriver
1 digital voltmeter or one volt-ohm meter

The Z-100 PC Series of Computers

The Z-100 PC Series consists of several computer series that are compatible with the IBM PC and the IBM PC XT computers. This manual is concerned with two series, the Z-130 PC Series and the Z-140 PC Series. If you are servicing another series, such as the Z-150 PC Series or Z-160 PC Series, refer to the service guide for those computers.

The Z-130 PC Series (Figure 1-1) is intended to be transportable and comes with a monitor built into its cabinet. The Z-140 PC Series (Figure 1-2) is intended for a fixed location and should not be moved frequently. This series requires an external monitor for operation.

Both computers are based on the 16-bit 8088 microprocessor.

The customer will add peripherals for some applications, some of which are illustrated in Figure 1-3 and Figure 1-4.

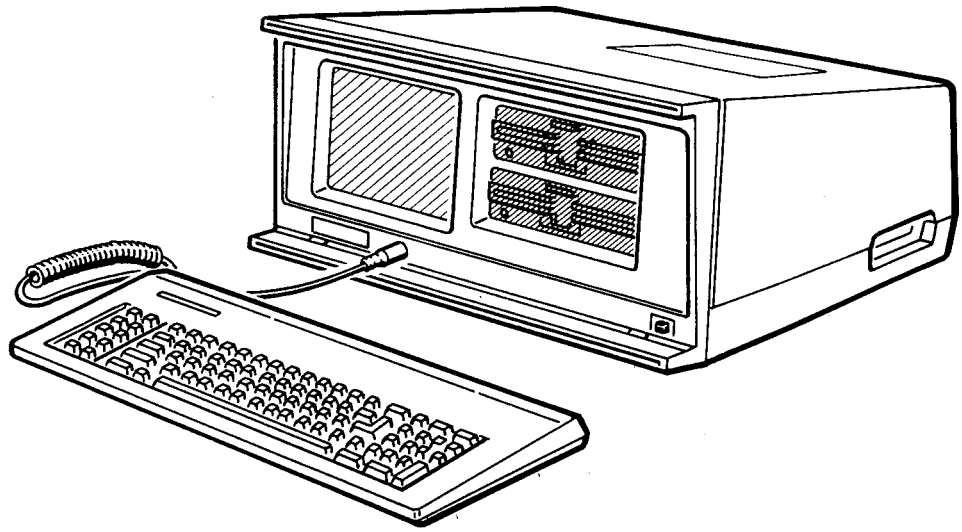


Figure 1-1: Basic Z-130 PC Series Computer

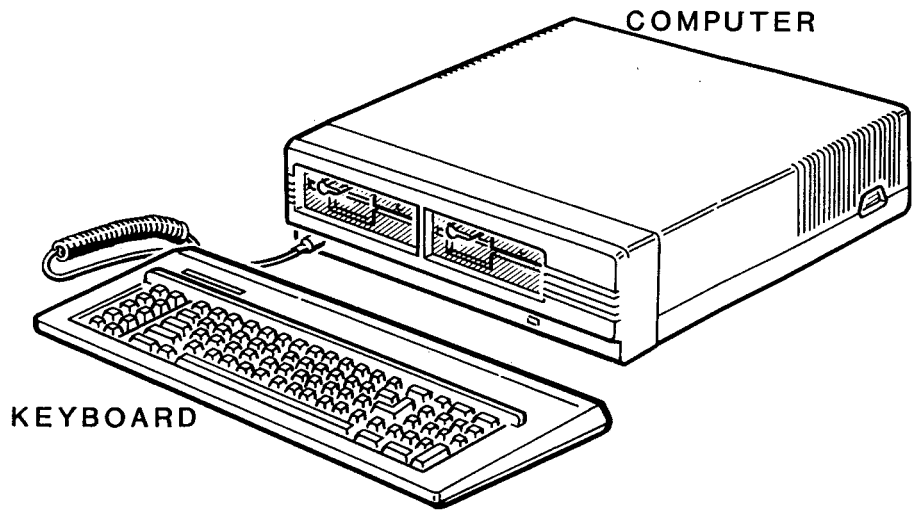


Figure 1-2: Basic Z-140 PC Series Computer

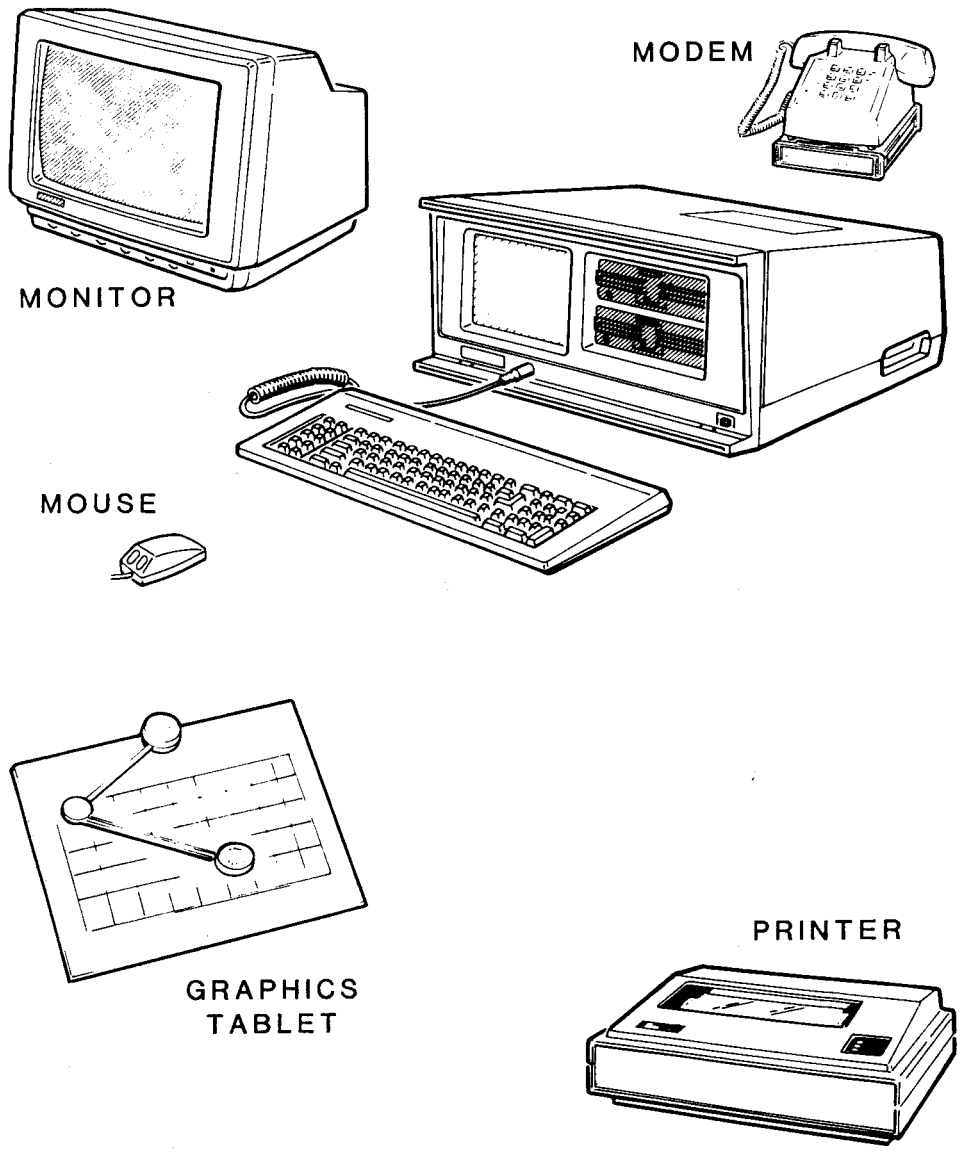


Figure 1-3: Z-130 PC Series Computer with Peripherals

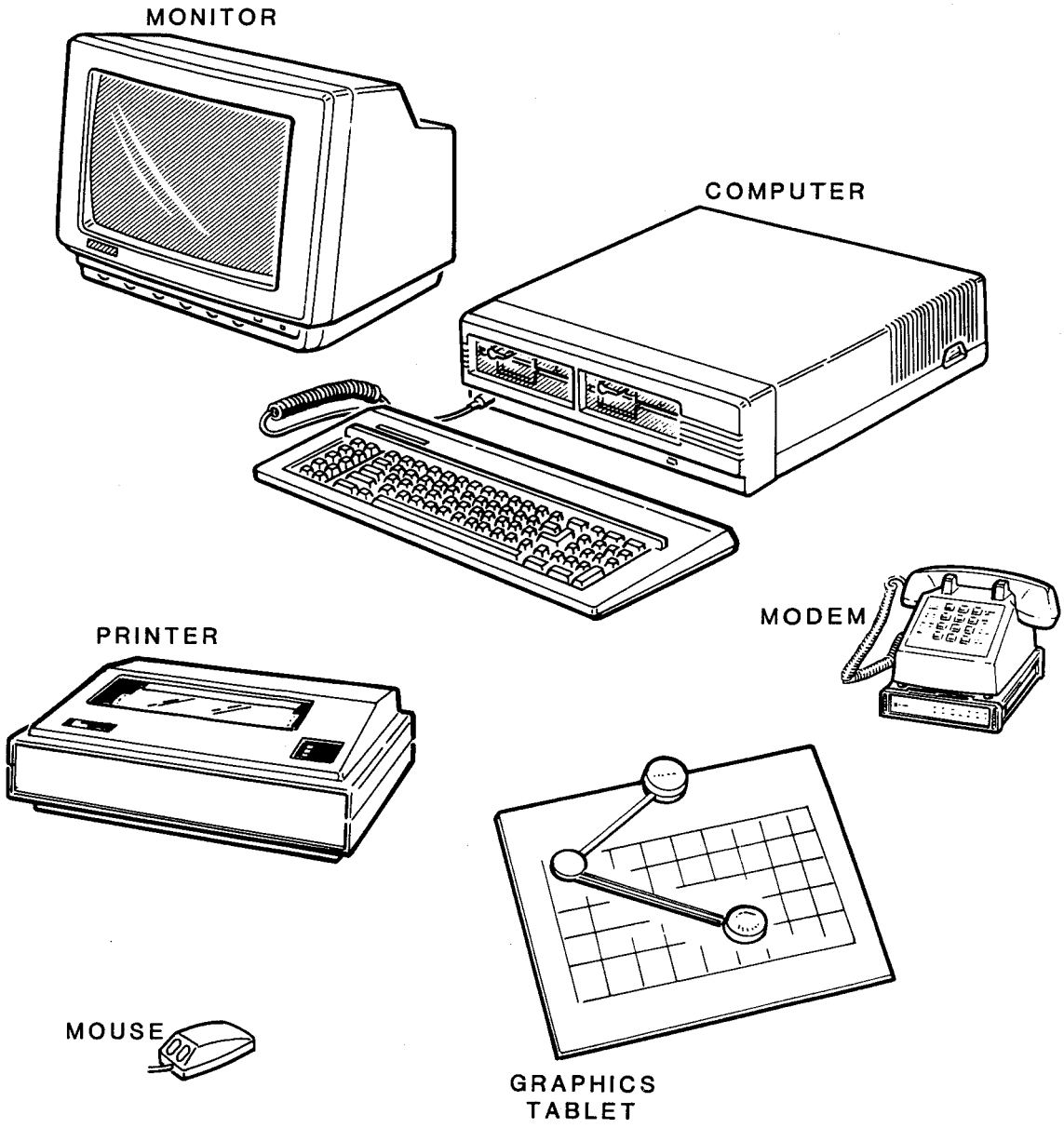


Figure 1-4: Z-140 PC Series Computer with Peripherals

Front View

The following is located on the front of the computer.

Z-130 PC Series

Refer to Figure 1-5.

- Built-in video display — 7-inch flat-screen CRT for displaying data.
- Keyboard — 84 keys for data entry and control functions.
- Keyboard connector — Input connector for the separate keyboard.
- 8 MHz switch — Push-to-latch, push-to-release switch to control CPU clock. Latched provides 8 MHz clock speed; released provides 4.77 MHz clock speed.
- Disk drives — Equipped with one or two 5.25-inch floppy disk drives for data storage. An additional Mitsubishi or Shugart disk drive may be added in the field to minimum (single-drive) systems (both have been approved). Figure 1-6 illustrates Shugart disk drives; refer to the inset in the figure for Mitsubishi.

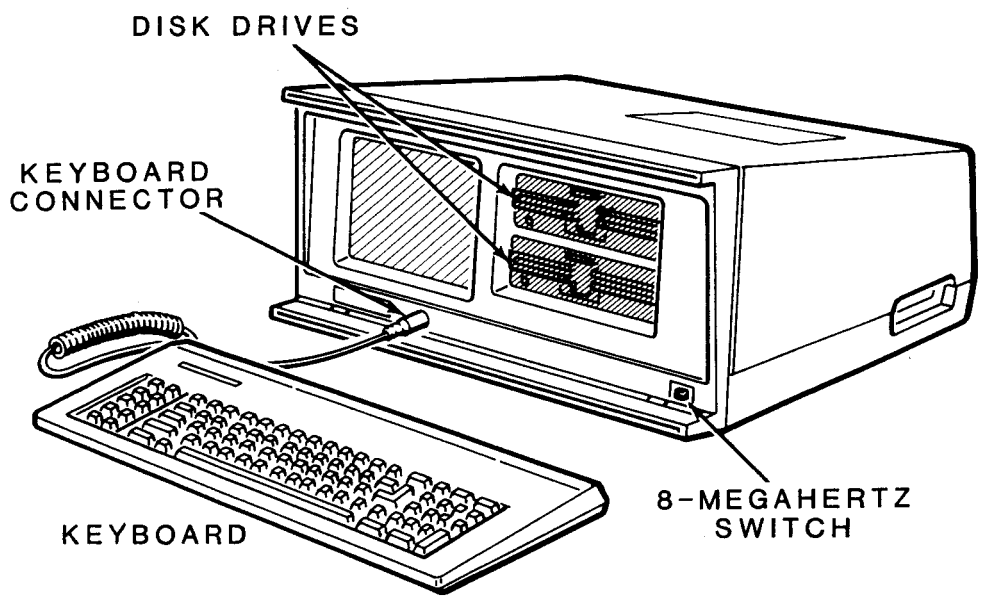


Figure 1-5: Z-130 PC Series Front View

Z-140 PC Series

Refer to Figure 1-6.

- Keyboard — 84 keys for data entry and control functions.
- Keyboard connector — Input connector for the separate keyboard.
- 8 MHz switch — Push-to-latch, push-to-release switch to control CPU clock. Latched provides 8 MHz clock speed; released provides 4.77 MHz clock speed.
- Power-on indicator — When lit, indicates power is applied and the CPU is functioning. If it is not lit, but the power is applied and the unit is on, it could indicate CPU failure.
- Disk drives — Equipped with one or two 5.25-inch floppy disk drives for data storage. An additional Mitsubishi or Shugart disk drive may be added in the field to minimum (single-drive) systems (both have been approved). The figure illustrates Mitsubishi disk drives; refer to the insert for Shugart.

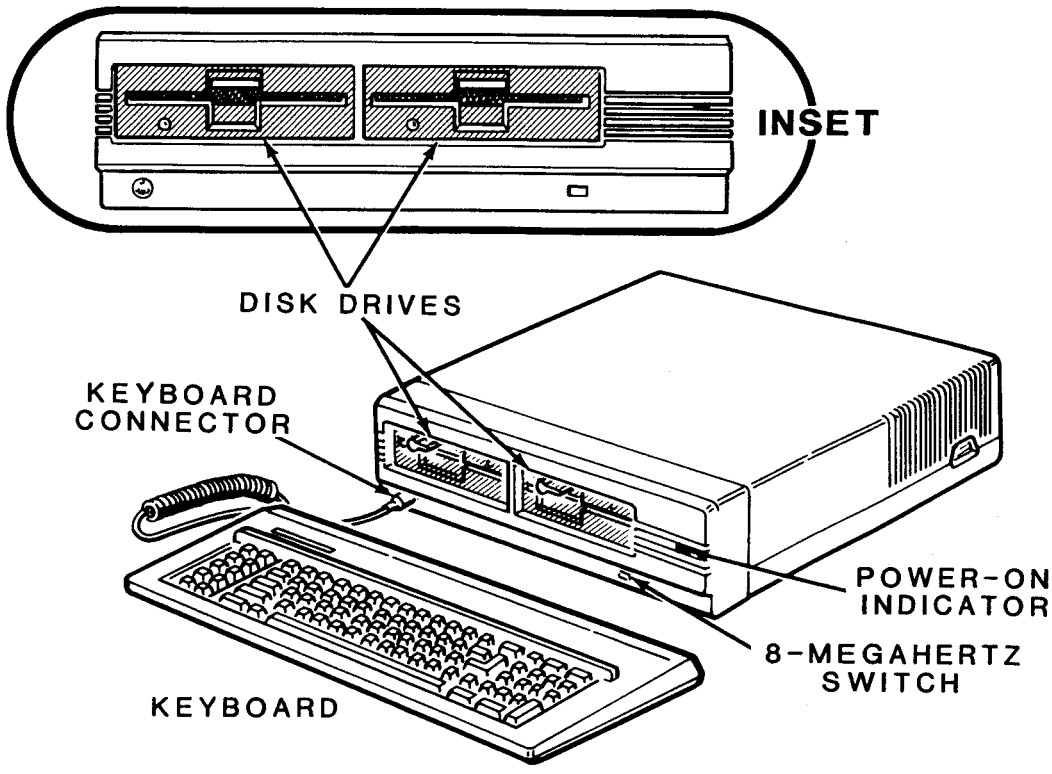


Figure 1-6: Z-140 PC Series Front View

Rear View

Refer to Figure 1-7 for the Z-130 PC Series and Figure 1-8 for the Z-140 PC Series.

The following describes the signals available at the various connectors on the back panel. A more complete description of these connectors and their pinouts is contained in Chapter 5, "Configuration."

- Serial connector — RS-232C DTE data input/output for a printer, modem, or other serial peripheral or communications device.
- Composite video connector — Composite video output for an external monochrome video monitor.
- RGB video connector — Red, green, blue, and intensity output for an external RGB (color) monitor.
- Parallel connector — Parallel Centronics-type printer output for a parallel printer or other peripheral.
- Power cord connector — AC power input.
- Power switch — On/off power switch.
- Line select switch — 120/240-volt line selection switch.
- Brightness control (Z-130 PC Series only) — Adjusts the intensity of the display for the built-in CRT.

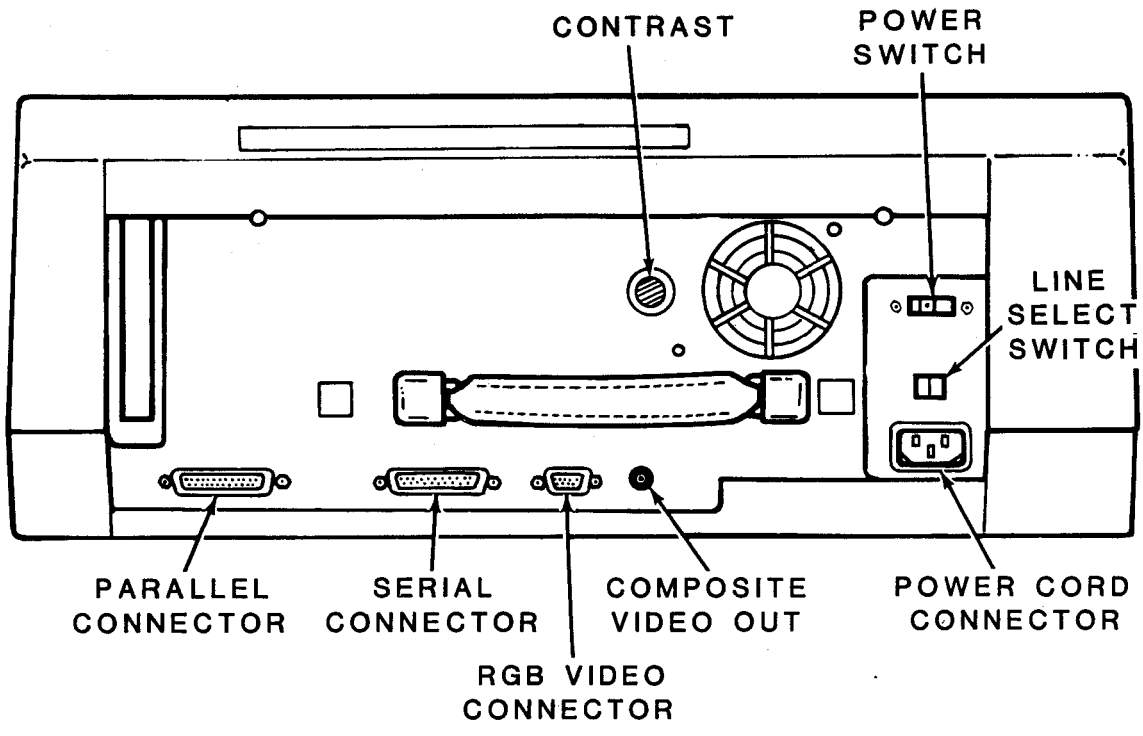


Figure 1-7: Z-130 PC Series Rear View

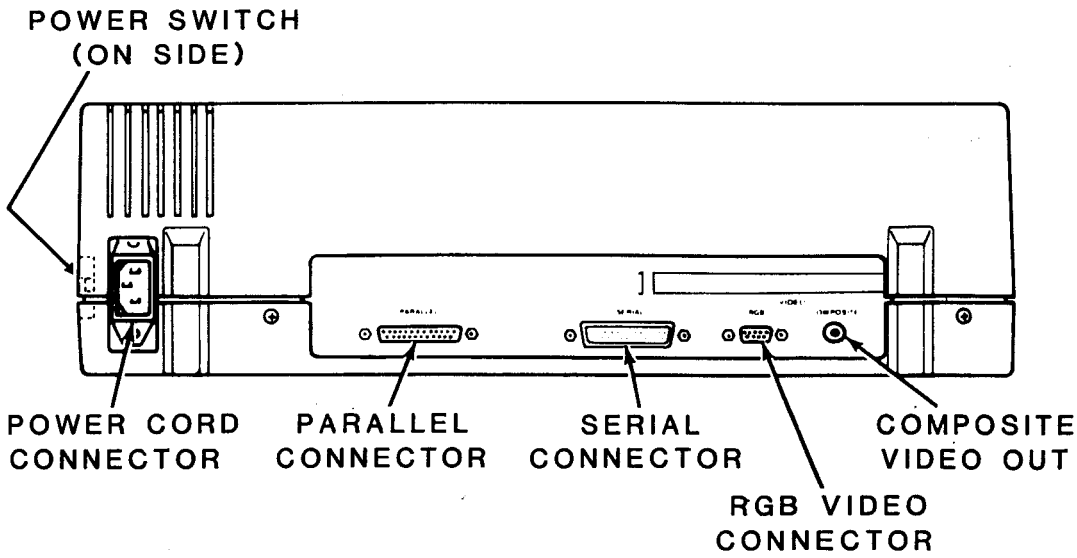


Figure 1-8: Z-140 PC Series Rear View

Specifications

Power Supply	
Input Voltage	115 VAC (95 VAC minimum to 130 VAC maximum) or 220 VAC (190 VAC minimum to 260 VAC maximum)
Input Line Frequency	60 Hz (48 Hz minimum to 62 Hz maximum) or 50 Hz (48 Hz minimum to 62 Hz maximum).
Input Line Current	4 amp maximum continuous (full load, 115 VAC).
Output Voltages	+5 VDC, +12 VDC, and −12 VDC.
Output Power	65 watts maximum.
CPU	
Type	8088 or 80C88 16-bit processor.
Clock Frequency	4.77 MHz or 8 MHz (switch selected).
Memory	
Type	64-and/or 256-kilobit devices; 128K or 256K, 8-bit words, dynamic RAM, standard; expandable to 640K. Parity bit checking.
Display	
Type	7-inch, flat-screen CRT (Z-130 PC Series only).

Video	640 × 200-pixel resolution (fully addressable in monochrome mode), 25 lines by 80 characters, 8 × 8-pixel character cell producing the 95-character ASCII set with true descenders, special graphics characters compatible with IBM PC software, addressable cursor, and reverse video.
Output	Composite monochrome video signal output (RCA phono jack). RGB color video signals (9-pin connector).

Video Logic

Memory	16K.
Color Selection	Foreground, background, and border.
Mode Selection	Text or all points addressable graphics.
Font	256 characters.
Bandwidth	7 or 14 MHz, mode-dependent.
Output	Monochrome and color RGB with intensity.
Sync Selection	External vertical, horizontal, and composite polarity.
Cursor type	Block, line, or blinking; selectable.
Other	Light pen interface.

Serial Input/Output

Channel	One DTE.
IC	8250 Asynchronous Communications Element.
Baud Rate	50 to 19200 baud.
Word Length	5, 6, 7, or 8 bits.
Start Bit	One start bit.
Stop Bits	One or two stop bits.
Parity	Odd, even, or none.
Port Addresses	COM1: 03F8H–03FFH; COM2: 02D0H–02DFH.

Duplex	Full- or half-duplex, programmable.
Handshaking	CTS, DSR, RTS, DTR.
Carrier Detect	Recognized.

Parallel Input/Output

Type	Centronics-compatible parallel output port (Female DB-25 connector).
Port Addresses	LPT1: 0378H–037FH.

Floppy Disk Controller, Disk Drives, and Disks

IC	µPD765 floppy disk controller.
Port Addresses	03F0H-03F7H.
Format (MS-DOS)	40-track, 8 or 9 sectors/track, 512 bytes/sector, double-density, modified frequency modulation (MFM) encoding format.
Drives	One or two internal 5.25-inch double-sided, double-density drives.
Motor Start Time	500 ms.
Head Load Time	35 ms.
Head Settle Time	25 ms.
Head Step Time	6 ms.
Heads	Two.
Write-protection	Recognized.

Expansion (Optional)

Type	Limited to optional interface card which may hold ROM-based software and allow one PC-compatible card to be installed inside the cabinet.

Keyboard

Type	84-key QWERTY arrangement with 8 cursor control keys. Generates the 128 ASCII character set. Includes autorepeat, 10 user-programmable function keys, and calculator-style keypad.
Keys	84 keys.
Modes	Extended function capabilities.
Microprocessor	8048 or 8748 keyboard processor (8048 Emulator).

Operating Environment	60–90 degrees Fahrenheit (16–32 degrees Celsius). 10–80% relative humidity.
Contacts	Single-pole, single-throw.
Dimensions	
Z-130 PC Series	8.5″ × 18″ × 17″ (21.59 × 45.72 × 43.18 cm).
Z-140 PC Series	4.75″ × 15.63″ × 16.5″ (12.07 × 39.69 × 41.91 cm).
Weight	
Z-130 PC Series	30 lbs. (13.1 kg).
Z-140 PC Series	28 lbs. (12.7 kg).
Operating Environment	50–85 degrees Fahrenheit (10–30 degrees Celsius), 20–80% relative humidity (non-condensing).

Board Location

The location of the circuit boards installed in the standard computer at the factory is shown in Figure 1-9 (Z-130 PC Series) and Figure 1-10 (Z-140 PC Series). Refer to these illustrations to locate and identify boards installed in the computer. Optional circuit boards and cards may be installed in the field.

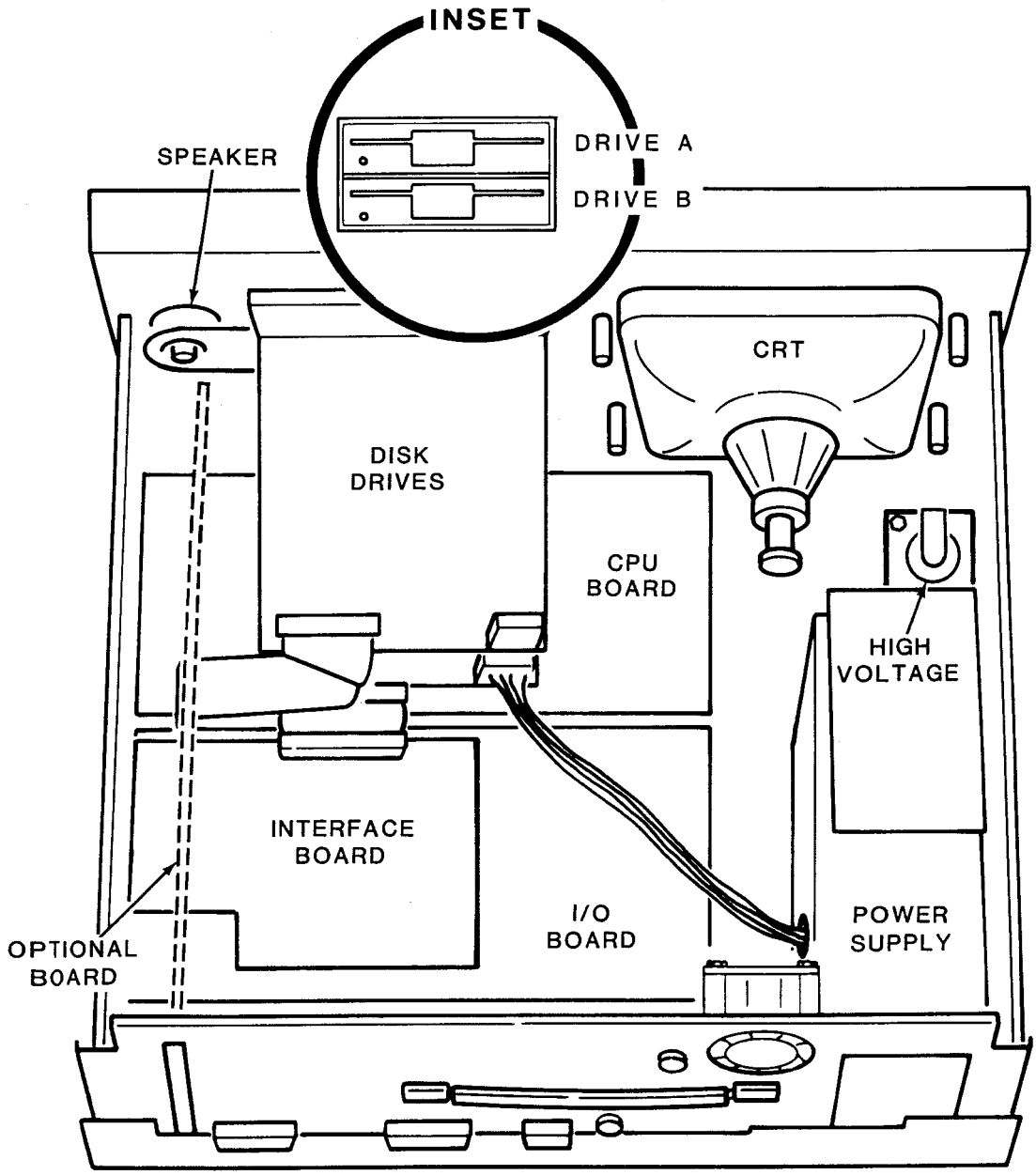


Figure 1-9: Z-130 PC Series Chassis

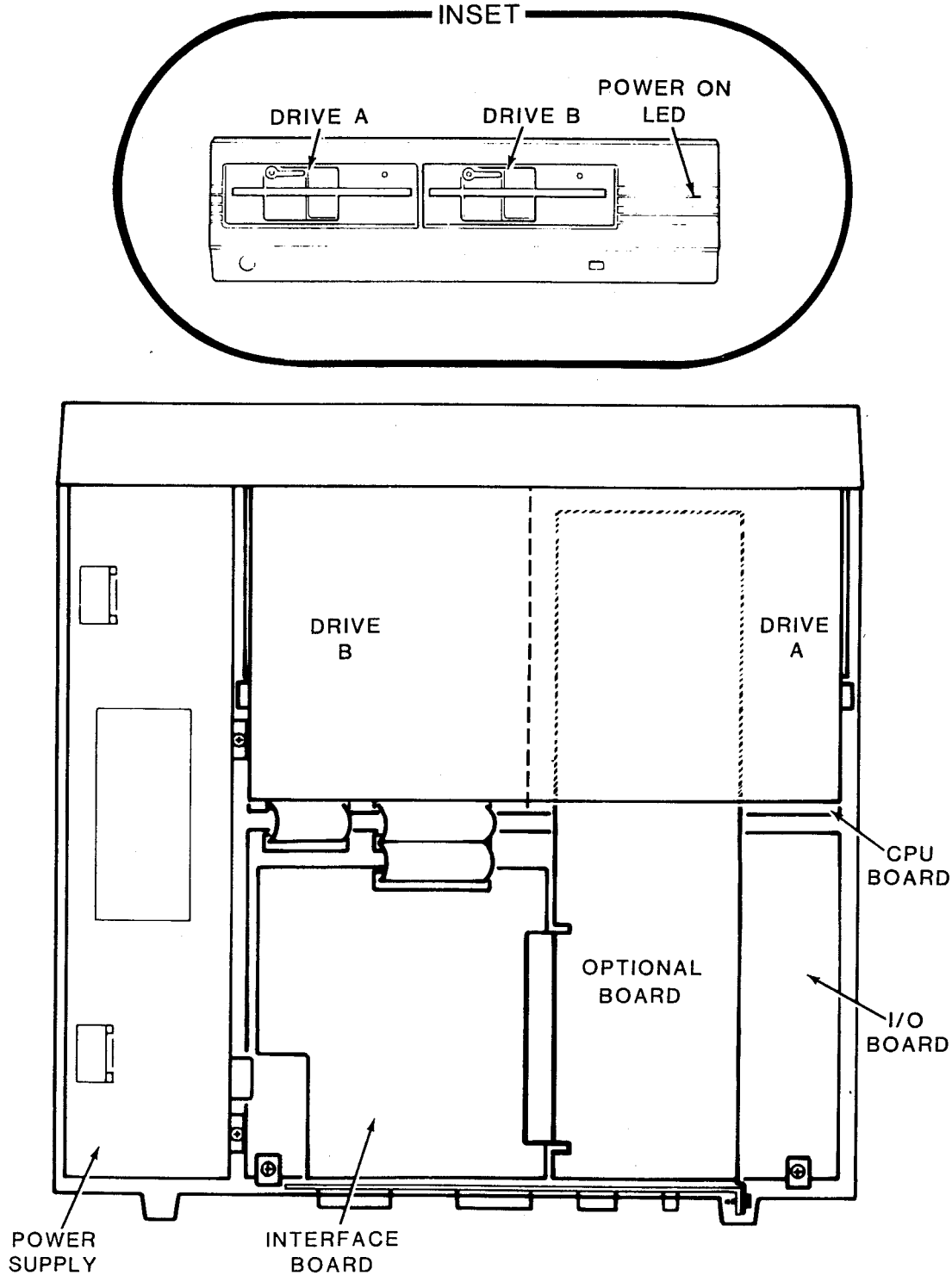


Figure 1-10: Z-140 PC Series Chassis

Model Numbers

The Z-100 PC family of computers is composed of several series, including the Z-130 PC Series and Z-140 PC Series that are covered in this manual. The full model number designates the configuration of a computer. An example of a model number is illustrated in Figure 1-11 with each part of the number defined.

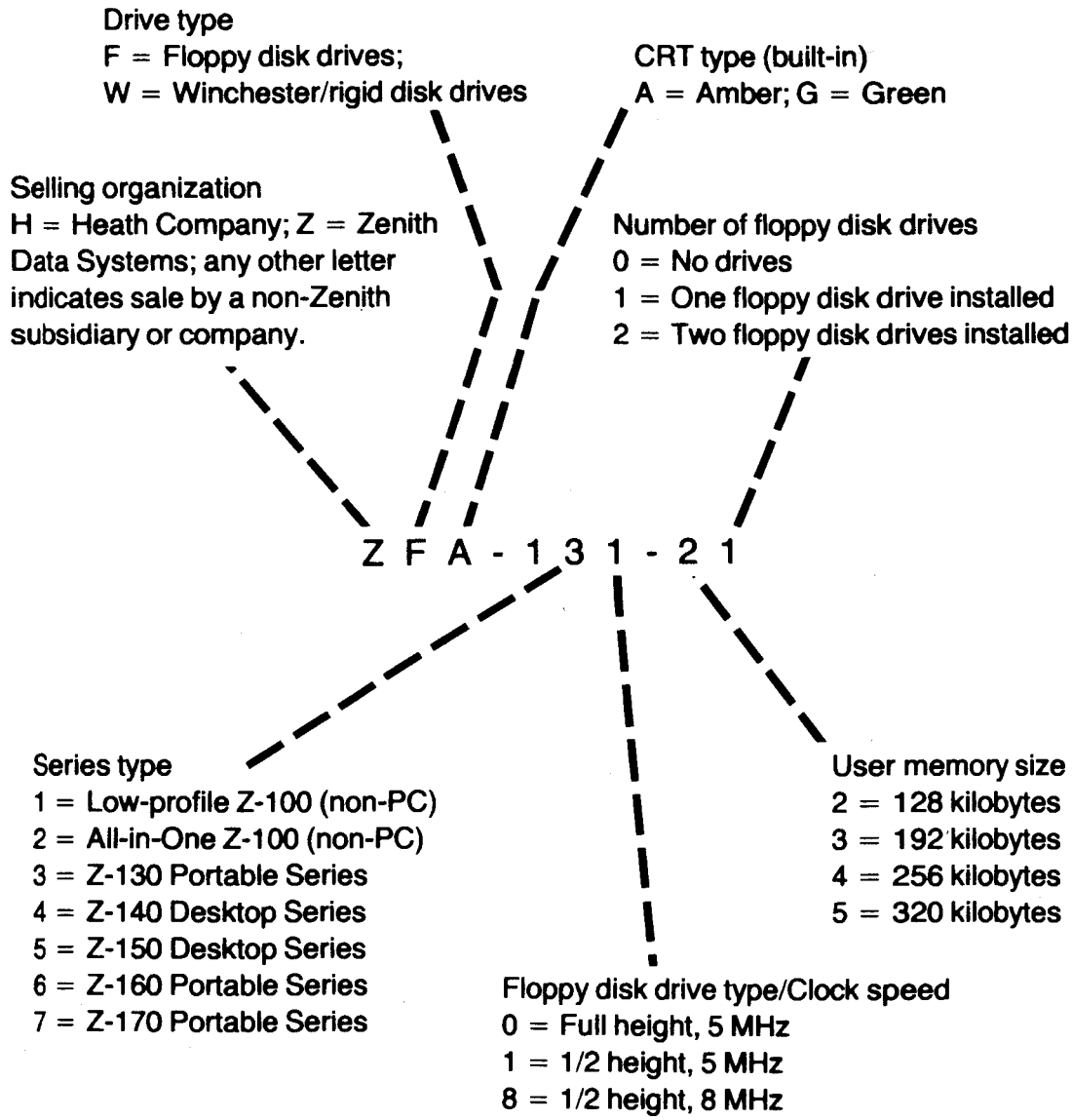

Drive type
F = Floppy disk drives;
W = Winchester/rigid disk drives
CRT type (built-in)
A = Amber; G = Green
Selling organization
H = Heath Company; Z = Zenith Data Systems; any other letter indicates sale by a non-Zenith subsidiary or company.
Number of floppy disk drives
0 = No drives
1 = One floppy disk drive installed
2 = Two floppy disk drives installed
Z F A - 1 3 1 - 2 1
Series type
1 = Low-profile Z-100 (non-PC)
2 = All-in-One Z-100 (non-PC)
3 = Z-130 Portable Series
4 = Z-140 Desktop Series
5 = Z-150 Desktop Series
6 = Z-160 Portable Series
7 = Z-170 Portable Series
Floppy disk drive type/Clock speed
0 = Full height, 5 MHz
1 = 1/2 height, 5 MHz
8 = 1/2 height, 8 MHz
User memory size
2 = 128 kilobytes
3 = 192 kilobytes
4 = 256 kilobytes
5 = 320 kilobytes

Figure 1-11: Model Number Definitions

Theory of Operation

The following material describes the internal boards and other major components of the system. A brief description of the function of each section is provided. Figure 1-9 (Z-130 PC Series) and Figure 1-10 (Z-140 PC Series) illustrate the location of the boards in the computer chassis. Figure 1-12 is the block diagram. Refer to these figures for the following discussion.

- Power supply — The power supply provides regulated voltages used by the various components within the computer. It is located along the left side of the cabinet, and uses a quasi-square wave switching regulator to produce three regulated output voltages, which are electrically isolated from the main voltage and share a common ground, the chassis of the power supply. This power supply is **not serviceable in the field;** defective power supplies must be returned to: ZDS Parts Department, Hilltop Road, St. Joseph, Michigan 49085.

- CPU board — The CPU board contains the CPU and system memory (RAM). All the timing, addressing, and generation of control signals for the computer originate on this board. The keyboard, speaker, and power/CPU-functioning LED are interfaced to this board.

  The CPU is the heart of the system. It contains all of the decision-making elements and controls the rest of the system. In the Z-130 PC Series and Z-140 PC Series, an 8088 is used as the system's CPU, with an option for an 8087 numeric coprocessor.

  The memory is used to store all programs and data that are being processed. Provisions are made for parity checking and may be expanded from a minimum system of 128 kilobytes to a maximum of 640 kilobytes using 64-kilobit and/or 256-kilobit memory devices.

- Input/output board — The input/output board combines the capabilities of a video logic board, a floppy disk controller board, a serial communications channel, and a parallel printer port. Video controller circuitry and floppy disk controller circuitry may be viewed as two discrete circuits that are interfaced to an active gate array responsible for controlling and processing data.

The video section of the board provides an interface between the computer and various display output devices, including an internal monochrome monitor (for the Z-130 PC Series) and an external monochrome or color monitor. The external monochrome output is interfaced through an RCA phono jack and the external RGB output through a 9-pin connector. Both outputs are located directly on the board and project through the rear of the computer cabinet.

Provision has been made for adding an optional light pen. It would connect to a 6-pin connector strip that can be installed on the board. However, there is no opening on the case to support this feature, nor does Zenith Data Systems supply any software support.

The floppy disk controller section of the board is capable of supporting two separate internal disk drives.

Finally, provision is made for communication to peripherals through a single DTE serial channel and a Centronics-type parallel printer port.

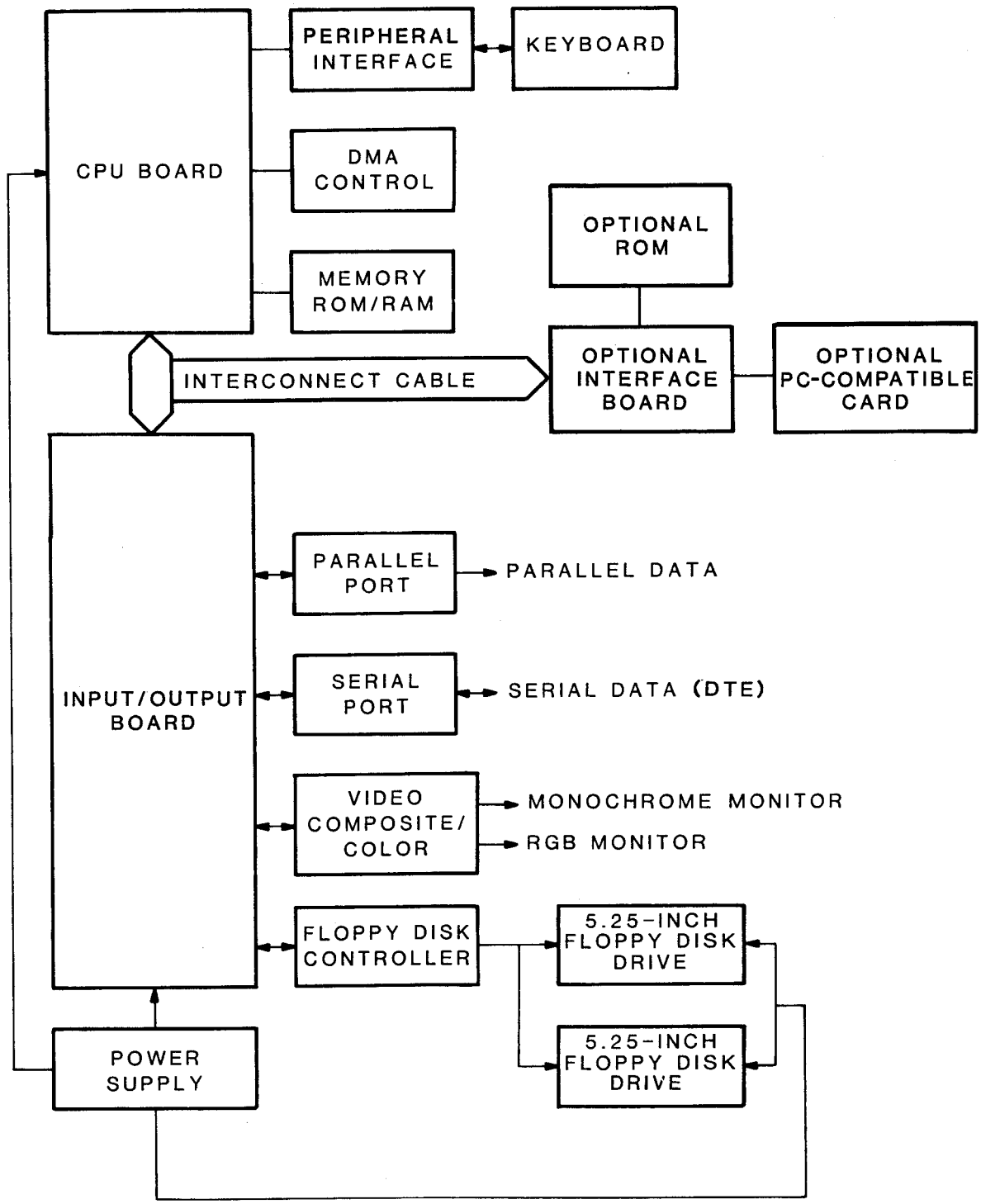


Figure 1-12: System Block Diagram

Chapter 2
Installation

This chapter discusses the basic installation of the Z-130 PC Series and the Z-140 PC Series of computers. For the purposes of this discussion, installation is defined as connecting the computer to power and peripherals in preparation for use. The computer must be installed any time it is moved.

CAUTION: Although neither computer series has a built-in Winchester disk drive, it may be offered in the future as an option. Any time a computer contains a Winchester rigid disk, the Winchester utility SHIP must be run before the computer is moved; otherwise, the disk and/or heads may be damaged.

Z-130 PC Series Preparation

Unpack the computer and peripherals. Have the customer save the shipping containers in case the computer ever needs to be shipped to another location.

Refer to Figure 2-1 and place the computer on the work surface as shown. Unlatch the keyboard by moving the two sliding latches down. Tilt the keyboard down and remove it from the front of the computer. The video monitor and disk drives are now exposed.

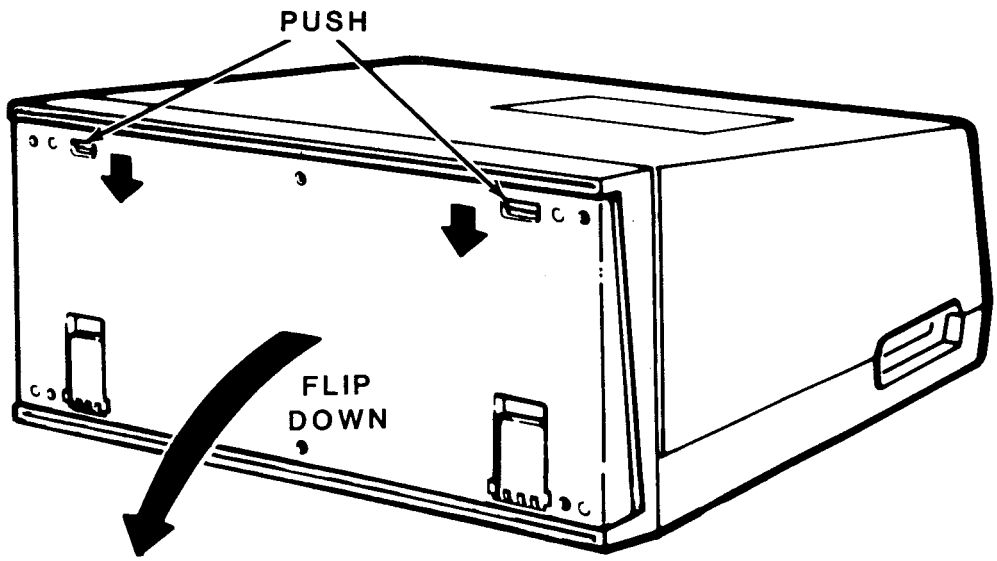


Figure 2-1: Z-130 PC Series Keyboard Removal

The door to the storage compartment of the Z-130 PC Series is a press-to-latch, press-to-release door. Refer to Figure 2-2 and open the cable storage compartment by pressing on the top front center of the door. Remove the keyboard cable and power cord; they are identified in the figure. Close the compartment.

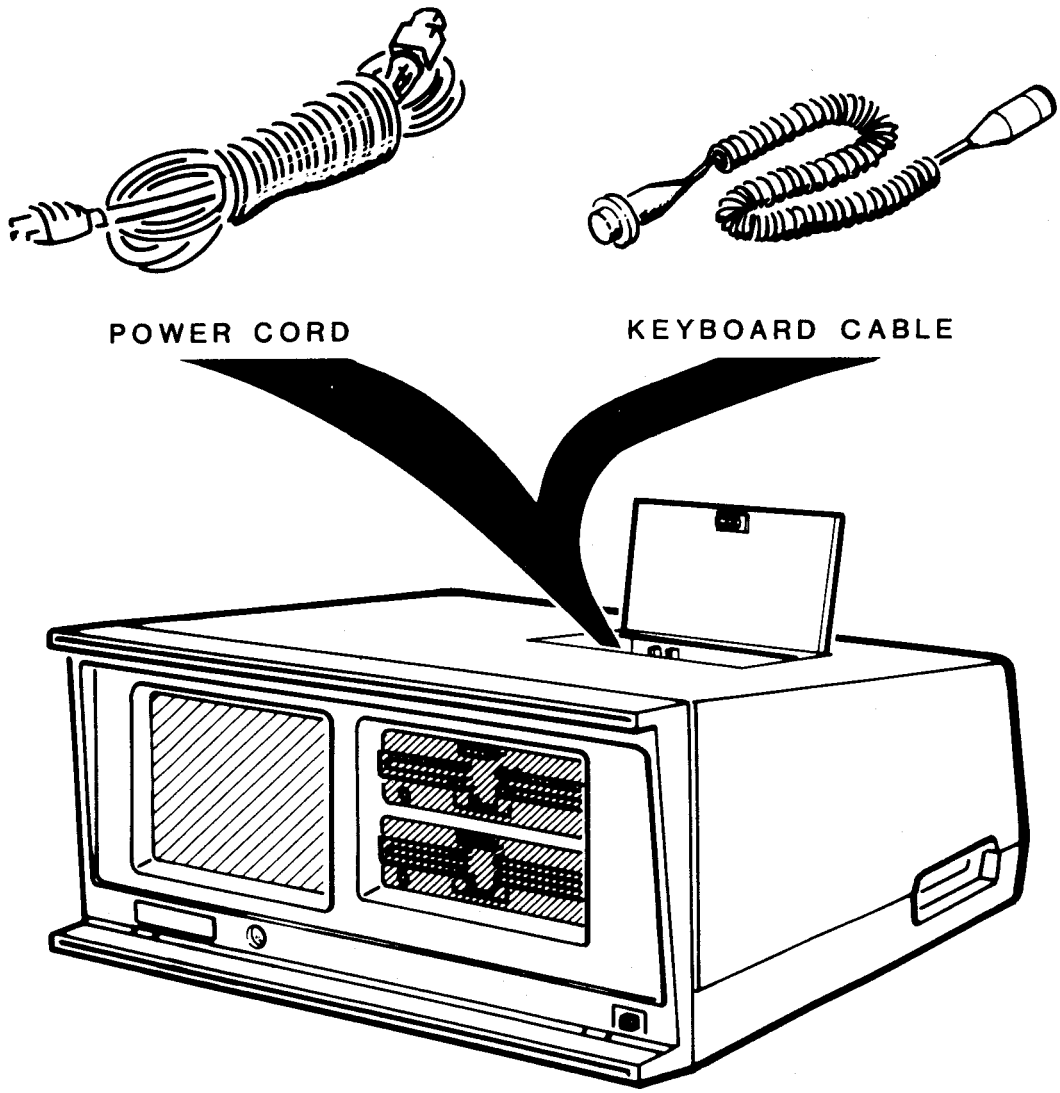


Figure 2-2: Z-130 PC Series Cable Storage Compartment

Z-140 PC Series Preparation

All cables required for installation are packaged separately in shipping boxes. Unpack the computer, monitor, and peripherals. Have the customer save the shipping containers in case the computer ever needs to be shipped.

Installation of Internal Options

Although both the Z-130 PC Series and Z-140 PC Series are considered "entry level" computers, they do offer limited expansion inside their respective cabinets. Options that may be installed include a second disk drive, an 8087 numeric coprocessor, memory up to 640 kilobytes, an interface board for the addition of ROM-based software and/or one standard IBM PC-compatible card.

There are some limitations, however, to adding certain Z-100 PC cards. For instance, the input/output board has no provision to connect to the Z-319 card, even though the MFM-140 monitor ROM supports the card. Therefore, the user cannot automatically switch between the normal video output of the input/output card and the output of the Z-319 card. Generally, the only cards and accessories that will not work well with the Z-130 PC Series and Z-140 PC Series are those that require internal connections or consist of more than one PC-compatible card.

Connectors

The connectors that are used for communication between the computer and various external devices, including the keyboard and peripherals, are described in Table 2-1 and illustrated in Figures 2-3 through 2-6.

Table 2-1: Connector Locations and Pin Definitions

CONNECTOR	LOCATION	DESCRIPTION	PIN NUMBER	SIGNAL NAME	TYPE
Serial	Back panel	RS-232C DTE connector.	1	Ground	—
		25-pin, D-type.	2	Transmit data	Out
		Base port address: 38FH.	3	Receive data	In
		Serial input/output.	4	Request to send	Out
			5	Clear to send	In
			6	Data set ready	In
			7	Signal ground	—
			8	Carrier detect	In
			9-19	not used	—
			20	Data Term.	Ready Out
			21	not used	—
			22	Ring Indicate	In
			23-25	not used	—
Parallel	Back panel	Centronics-compatible.	1	Strobe	Out
		25-pin, D-type.	2	Data 1	Out
		Base port address: 378H or	3	Data 2	Out
		3BCH (selectable).	4	Data 3	Out
		Parallel output.	5	Data 4	Out
			6	Data 5	Out
			7	Data 6	Out

Table 2-1 (continued): Connector Locations and Pin Definitions

CONNECTOR	LOCATION	DESCRIPTION	PIN NUMBER	SIGNAL NAME	TYPE
			8	Data 7	Out
			9	Data 8	Out
			10	Acknowledge	In
			11	Busy	In
			12	Paper end (out)	In
			13	Select	In
			14	Auto FDXT	Out
			15	Error	In
			16	Initialize	Out
			17	Select in	Out
			18-25	Ground	—
Composite	Back panel	RCA pin connector. Video output for monochrome monitor.			
RGB	Back panel	RGB and intensity. 9-pin, D-type. Video output for RGBI color monitor.	1	Ground	—
			2	Ground	—
			3	Red	Out
			4	Green	Out
			5	Blue	Out
			6	Intensity	Out

Table 2-1 (continued): Connector Locations and Pin Definitions

CONNECTOR	LOCATION	DESCRIPTION	PIN NUMBER	SIGNAL NAME	TYPE
			7	not used	—
			8	Horizontal sync	Out
			9	Vertical/composite sync	Out
Keyboard	Front panel	5-pin, DIN-type keyboard connector.	1	Keyboard clock	Out
			2	Keyboard data	In
			3	Keyboard reset	Out
			4	Ground	—
			5	+5 volts DC	Out

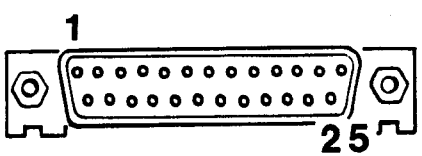


Figure 2-3: Serial connector

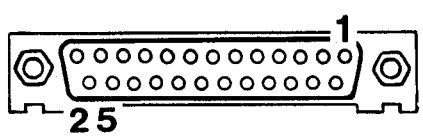


Figure 2-4: Parallel Connector

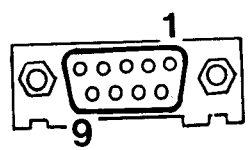


Figure 2-5: RGB Connector

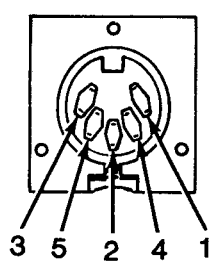
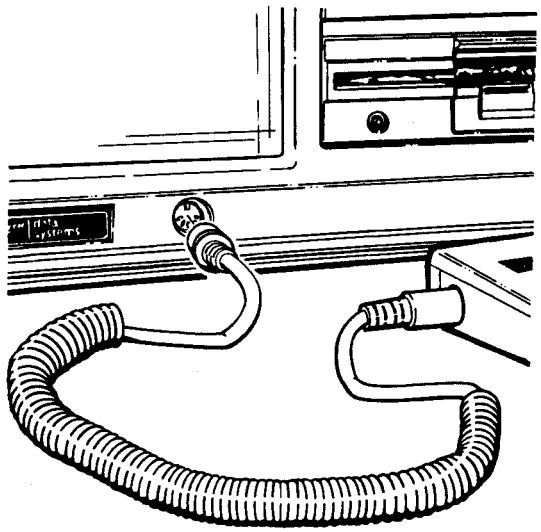


Figure 2-6: Keyboard Connector

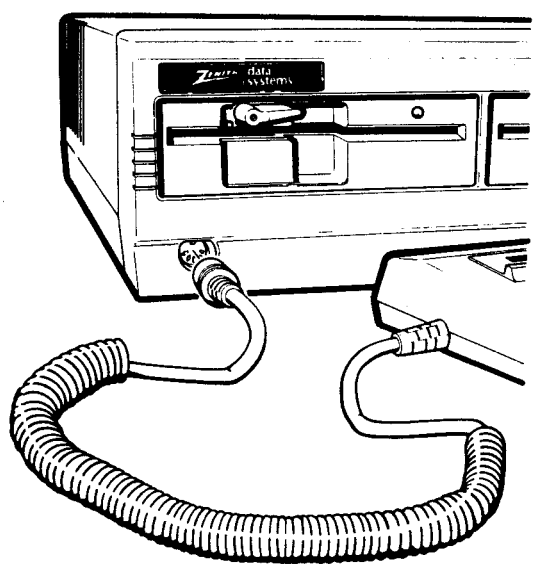
- Refer to Figure 2-7 and place the keyboard in front of the computer.

  — For the Z-130 PC Series only: Connect one end of the keyboard cable to the keyboard as shown.

  — For both Z-130 PC Series and Z-140 PC Series: Connect the free end of the keyboard cable to the keyboard connector on the front of the computer.



Z-130 PC SERIES



Z-140 PC SERIES

Figure 2-7: Keyboard Connection

Peripheral Connections

Refer to Figure 2-8 (Z-130 PC Series) and Figure 2-9 (Z-140 PC Series) for the following discussion.

Place the computer where it is to be used. Position it for easy access to the back panel.

- If an external monitor is to be used, unpack it and place it where it is to be used. Make sure there is access to all monitor controls and connectors.

  — For RGB monitors: Connect one end of the cable to the RGB video connector on the back of the computer. Connect the other end to the connector on the monitor; refer to the monitor's manual for the location.

  — For monochrome monitors: Connect one end of the cable to the composite video connector on the back of the computer. Connect the other end to the connector on the monitor; refer to the monitor's manual for the location.

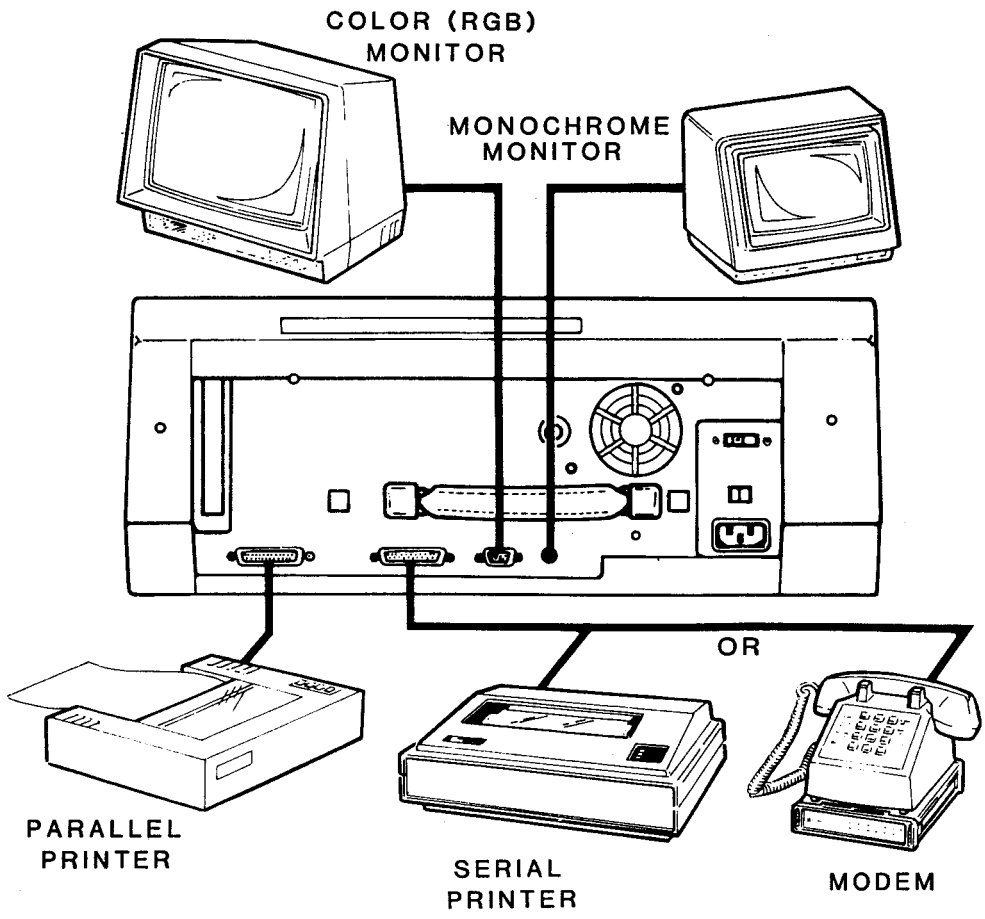


Figure 2-8: Z-130 PC Series Basic Peripheral Connections

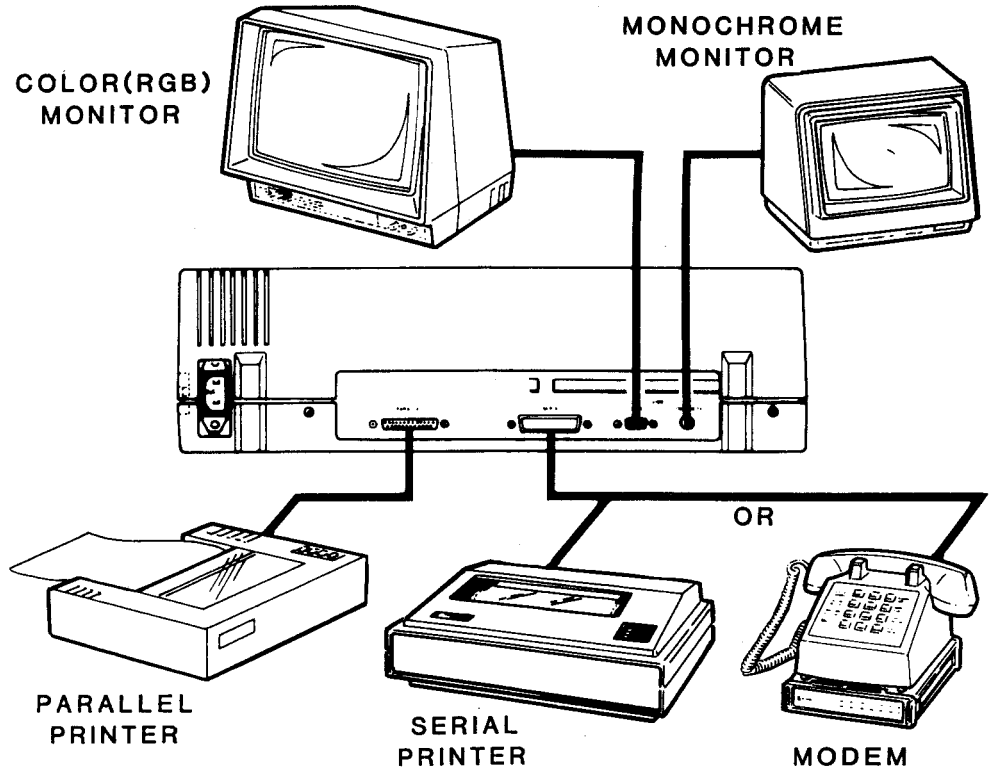


Figure 2-9: Z-140 PC Series Basic Peripheral Connections

Final Connections

CAUTION: Make sure the line select switch is properly set for your power source.

- Before connecting the computer or any peripherals to an AC power source, turn all power switches off.

NOTE: If several peripherals are to be used, a multiple outlet box or power strip may be used to turn on (or off) all system components at the same time. If a switched outlet is used, make sure it is properly rated for the system power requirements.

- Place the monitor where it will be used and plug it into the AC power source.

- Place the keyboard where it will be used; it receives its power from the computer.

- Place any other peripherals in their operating locations and plug their respective power cords into the AC power source.

- The computer uses a detachable power cord; plug the appropriate end into the the computer and the other end into the AC power source.

Before Applying Power

1. Remove the cardboard shipping insert from the disk drives. Have the customer retain the shipping inserts and use them whenever the computer is moved.

2. Make sure the power cord is plugged into both the computer and the AC power source.

3. Make sure the keyboard cable is plugged into the computer and, for the Z-130 PC Series, make sure the cable is plugged into the keyboard.

Keyboard Adjustment

Refer to Figure 2-10 (Z-130 PC Series) or Figure 2-11 (Z-140 PC Series).

The keyboard has a tilt adjustment that allows it to be tilted at one of two angles. The angle is determined by the position of two legs on the bottom of the keyboard. Open the legs to increase the angle; close the legs to decrease the angle.

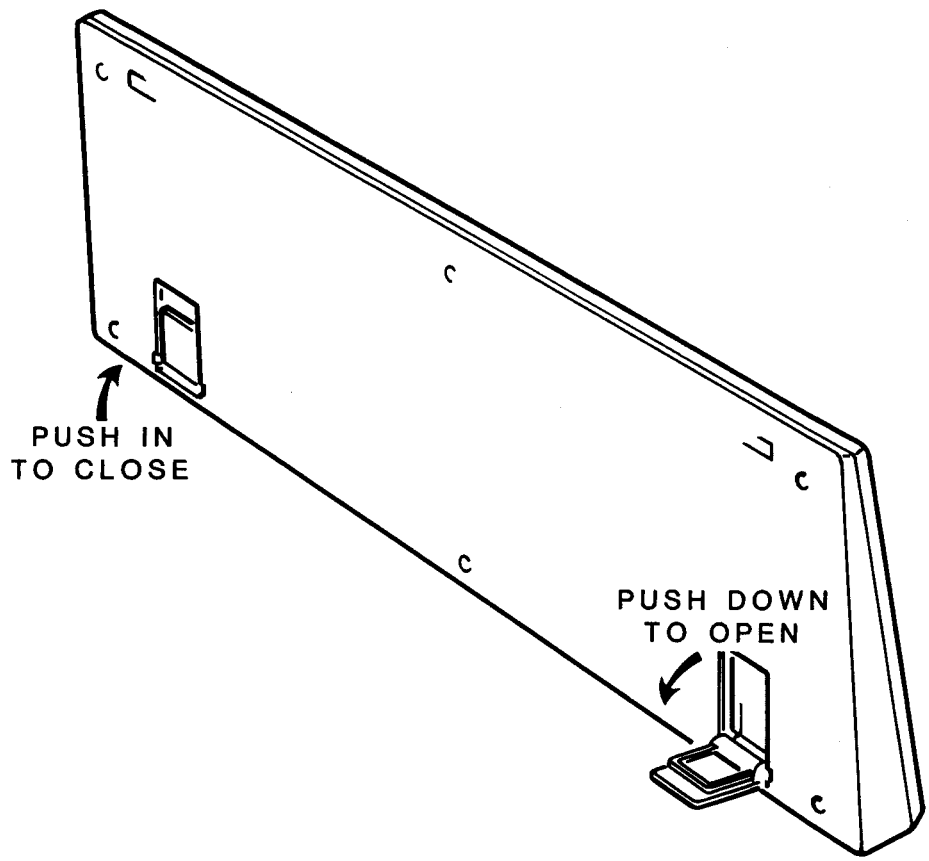


Figure 2-10: Z-130 PC Series Keyboard Adjustment

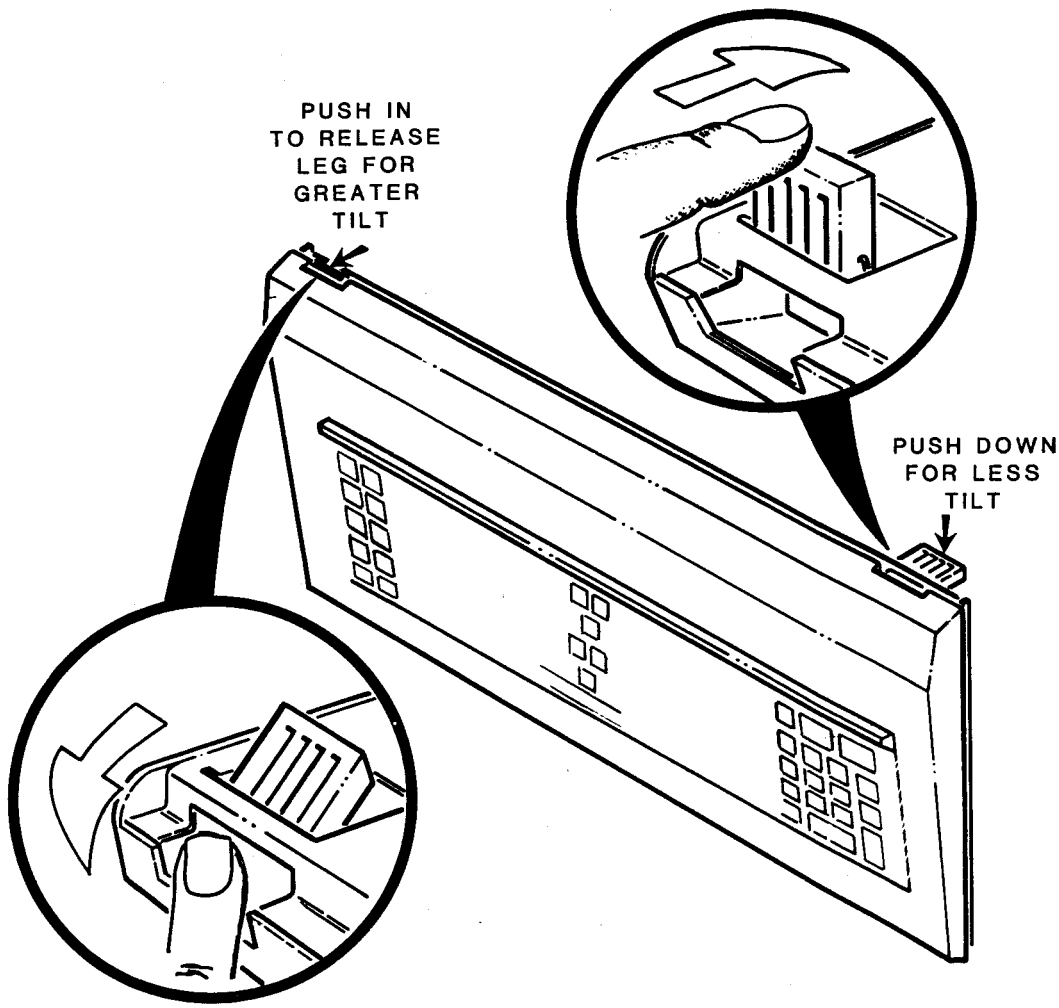


Figure 2-11: Z-140 PC Series Keyboard Adjustment

Chapter 3

Operation

This chapter is not intended to provide complete operating instructions; it does provide a quick reference guide to the basic operation of the computer.

Power Up

Turn on the computer and all peripherals. The fan in the power supply will begin to run and the power-up self-tests will be executed. During the self-tests, the disk drives will come on and test head movement, generating some noise.

The self-tests check handshaking between the CPU and the rest of the system. Most major failures can be detected at this time.

Factory assembled computers are set to autoboot (automatically load the disk operating system from a floppy disk). To defeat this function, press the **ESC** key during the power-up sequence. Autoboot can be disabled by setting a configuration switch on the CPU board as described in Chapter 5, "Configuration."

If no disk is in the drive, the following error message will occur about 20 seconds after turning on the computer.

```
*** DISK ERROR: DRIVE NOT READY! ***
```

Disk Drives

The disk drives are illustrated in Figure 3-1 (Z-130 PC Series) and Figure 3-2 (Z-140 PC Series).

On two-drive systems, the top drive (Z-130 PC Series) or the left drive (Z-140 PC Series) will be designated as drive A. The bottom or right drive will be drive B. If only one drive is installed, it is drive A.

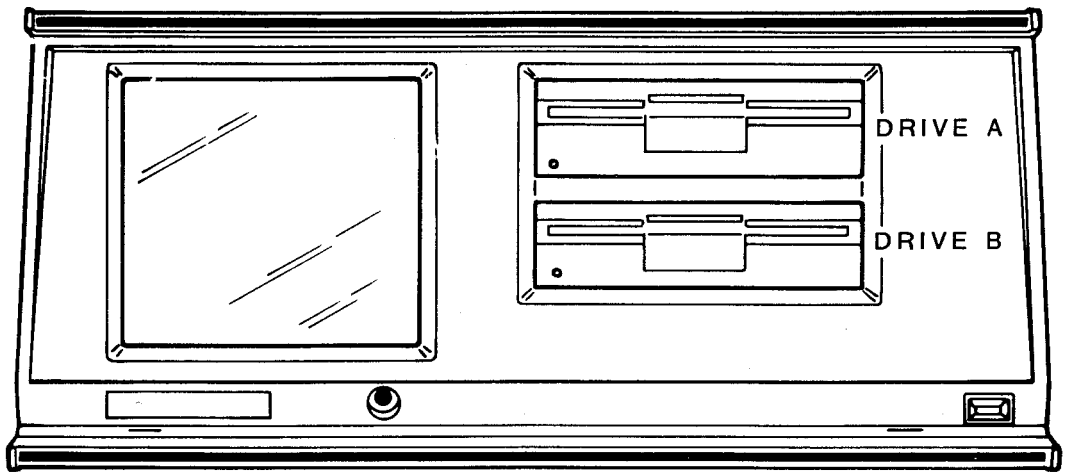


Figure 3-1: Z-130 PC Series Drive Identification

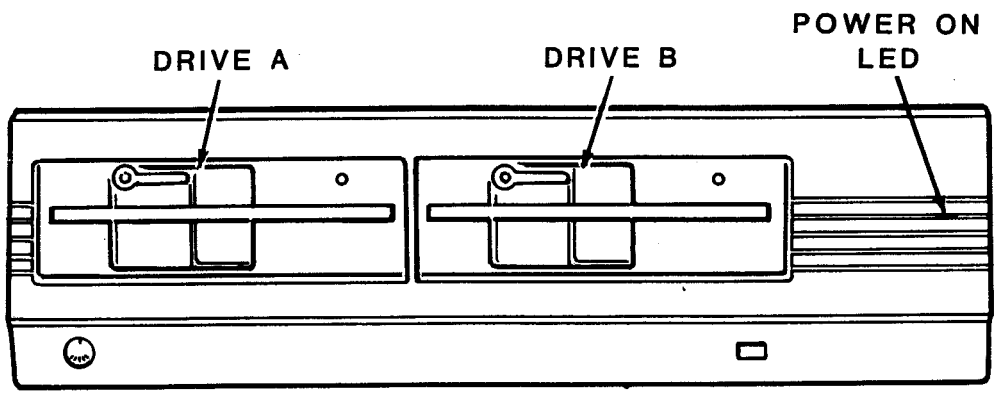


Figure 3-2: Z-140 PC Series Drive Identification

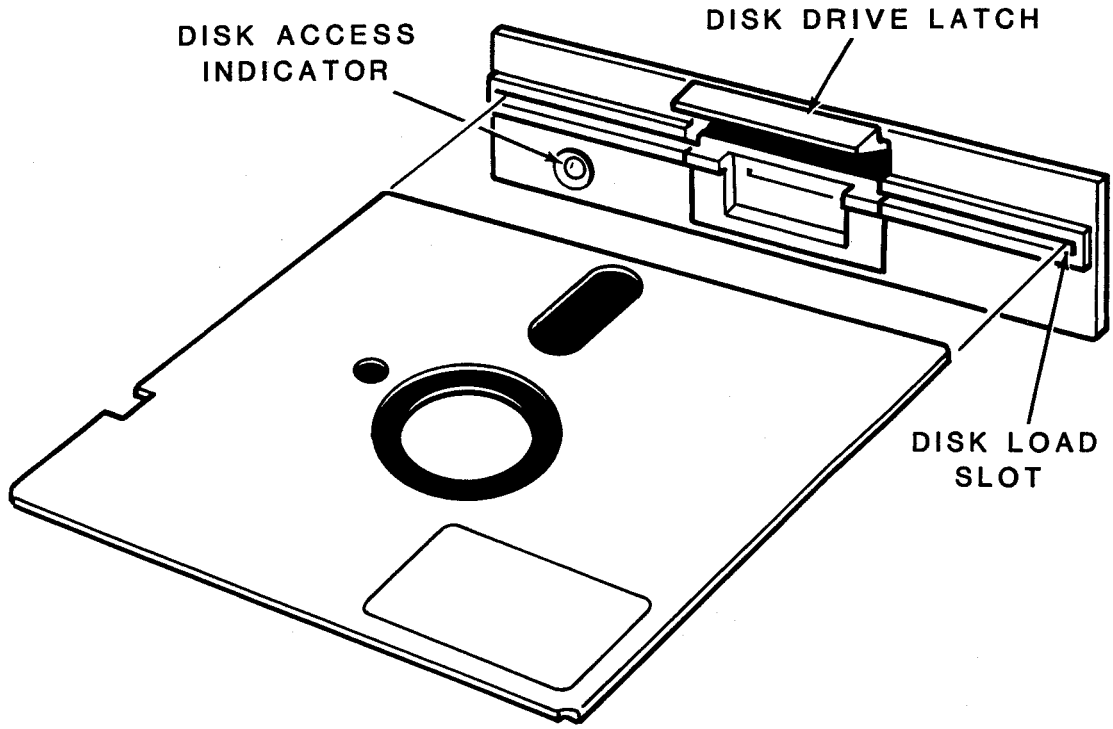


Figure 3-3: Disk Drive Features

The illustration in Figure 3-3 identifies the various drive features.

- Disk load slot — Insert the floppy disk in this slot as shown in the figure.

  CAUTION: If the disk is not positioned correctly, the unit will not operate properly and the disk or disk drive may become damaged.

- Disk drive latch — This may be a latch, door, or handle. Closing the latch engages the drive hub into the center hole of the disk and allows the drive to operate. If the latch is difficult to close, open the drive and remove the disk; examine the edges of the center hole for damage. Make sure the disk is properly positioned (as shown in the figure) when it is inserted into the drive.

- Disk access indicator — When this indicator is lit, the computer is attempting to access the disk.

Disk Care

To avoid damaging the disks, note the following precautions:

When preparing a label for a disk, write on it **before** placing it on the disk. If you must write on a label that is attached to a disk, use only a felt-tip pen. Pencils or ball point pens can damage the disk.

A disk should be stored upright in its protective envelope. Keep the disk away from heat and direct sunlight. Do not bend the disk or use paper clips on it. Do not touch the exposed areas of the disk.

Magnets or magnetized objects can erase some of the information stored on the disk. X-rays also may erase data. Do not expose disks to magnetic fields or X-ray sources.

Computer Controls

Keyboard

The keyboard contains 84 keys, which are discussed in groups. An illustration of the keyboard, with the keys being explained outlined in black, accompanies each discussion.

All keys except the SHIFT, CTRL, ALT, CAPS LOCK, SCROLL LCK, and NUM LCK keys generate repeat entries. When the key is held down, the letter (or other symbol) will start repeating. The longer the key is held down, the faster the repeat entry is generated.

Alphabetic Keys

The keyboard contains the standard 26 letters of the alphabet arranged as they are on a typewriter. These keys allow entry of upper or lowercase letters. When the SHIFT key is held down or the CAPS LOCK key is engaged (indicator lit), uppercase letters will be entered.

These keys (enclosed by the dark lines) are shown in Figure 3-4.

NOTE: The CAPS LOCK key shifts only the letter keys. Other keys are not affected.

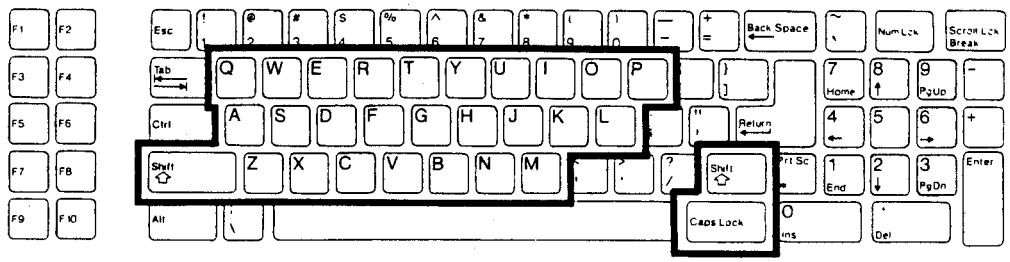


Figure 3-4: Alphabetic Keys

Nonalphabetic Keys

The nonalphabetic keys are shown in Figure 3-5. These include numbers, punctuation marks, and special characters. The lower marking on each key is generated when both SHIFT keys are released. The upper marking on the key is generated when either SHIFT key is pressed. The CAPS LOCK key will not shift these keys.

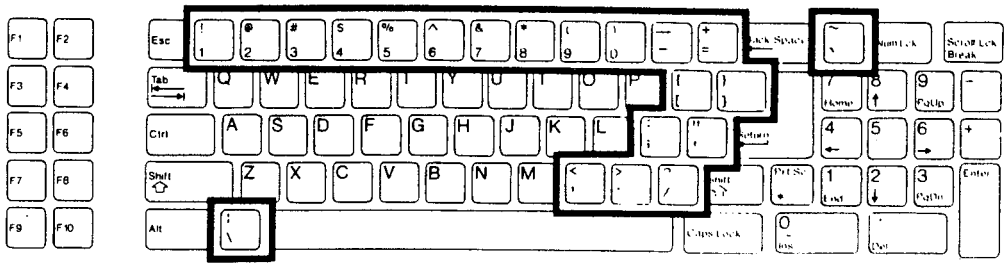


Figure 3-5: Nonalphabetic Keys

Other Keys

Refer to Figure 3-6 for the following discussion, which describes the most common function for each key. Software may direct any key to cause some other function to occur. Any key that has a special function usually is described in the documentation that accompanies the software.

The space bar functions just as it does on a typewriter. Enter blank spaces by pressing this bar.

BACK SPACE functions like a typewriter. Move the cursor to the left using this key.

TAB causes the position of the cursor to move to the next tab column.

RETURN moves the cursor to the left side of the display, or informs the computer that an entry has been completed. In most cases, the software provides a line feed when this key is pressed, moving the cursor to the next lower line.

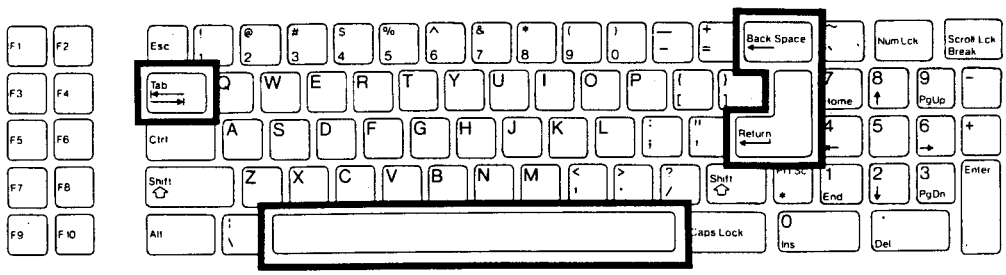


Figure 3-6: Common Control Keys

Special Function Keys

Figure 3-7 shows the keys described below.

Special function keys F1 through F10 are used for special purposes by some programs.

1/END, 2/↓, 3/PGDN, 4/←, 6/→, 7/HOME, 8/↑, 9/PGUP are cursor control keys. When none of the SHIFT or NUM LCK keys are pressed, these keys are used to control cursor movement and screen presentation by some programs.

0/INS and ./DEL are used when none of the SHIFT or NUM LCK keys are pressed. These keys are used in applications which require insertion and deletion operations.

SCROLL LCK/BREAK is used to control screen scrolling or to interrupt program execution and is not always active.

PRTSC/* is used to enter the asterisk or, when used with the SHIFT key, sends the contents of the screen to a printer (if the printer is properly configured).

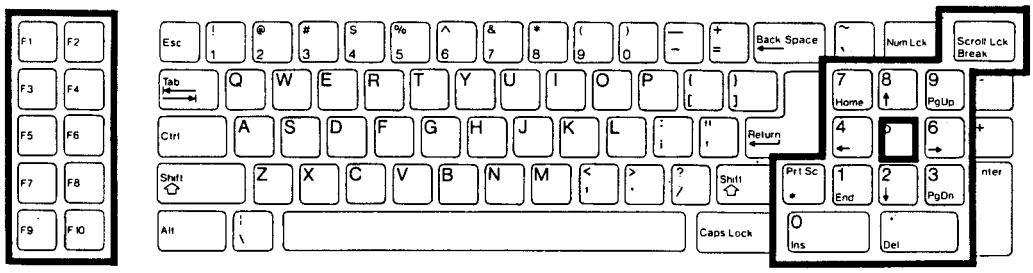


Figure 3-7: Special Function Keys

Control Keys

Figure 3-8 shows the control keys which are used in combination with other keys to perform some function.

ESC is used to stop the execution of a program, or to perform special functions when pressed with another key.

CTRL is used to perform special functions when pressed at the same time as another key.

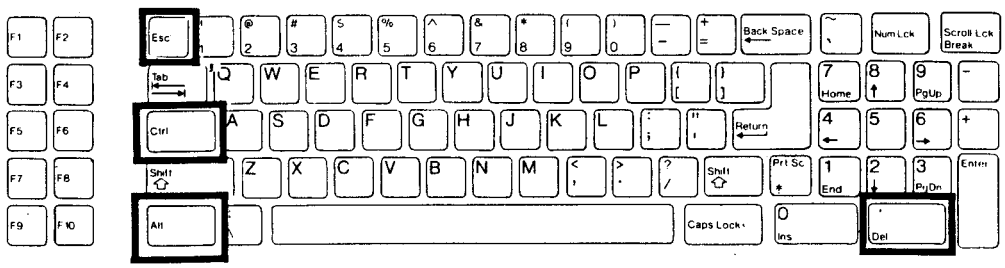


Figure 3-8: Control Keys

ALT is used to enter special commands when pressed at the same time as another key.

The CTRL, ALT, and DEL keys are used in combination to reset the computer. All three keys must be pressed at the same time.

Calculator Keyboard Operation

Figure 3-9 shows these keys.

NUM LCK, when pressed, shifts the normal functions of the cursor control keys and the INS and DEL keys to that of a calculator keypad. When the indicator in the NUM LCK key is lit, the number keys are active. When the indicator is out, the cursor control functions are active.

0-9, ., +, −, and ENTER keys function like a calculator keypad when the NUM LCK indicator is lit.

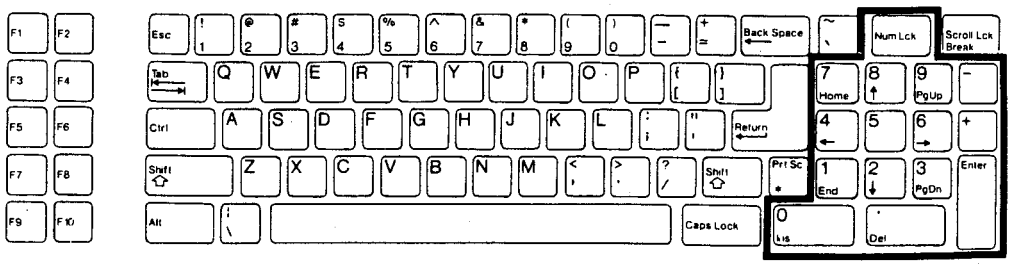


Figure 3-9: Calculator Keypad

Resetting the Computer

There are two ways to reset the computer: through the keyboard, or by turning the power off and then on again.

To reset the computer through the keyboard, press the **CTRL**, **ALT**, and **DEL** keys at the same time. This will reset the computer to the point just after the power-up test. If the system is set to autoboot, the operating system will be reloaded into the computer memory. This procedure will cause all of the information in system RAM to be lost.

You can also reset the computer by turning the power switch off and then on again. This has the same effect as the keyboard reset, but also forces the computer through the power-up test.

CAUTION: Turning the power off will erase all of the system RAM.

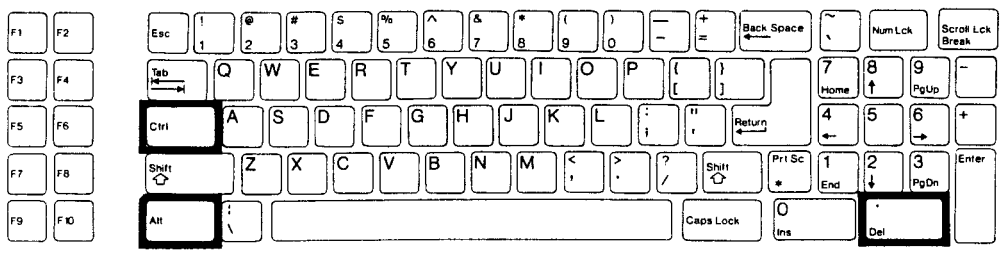


Figure 3-10: Resetting the Computer

Defeating Autoboot

To place a computer set to autoboot in the system monitor mode, perform one of the two following procedures.

- Press the **ESC** key during power up (when the computer is first turned on). This will cause the system to ignore the autoboot routine, but will take effect only before the routine is started.

- If the system has already booted, press the **CTRL**, **ALT**, and **INS** keys at the same time. This will place the computer in the monitor mode regardless of any software that may be running. Note, however, that there may be instances where the CPU is locked up and this sequence will have no effect; you must turn the computer off, wait five seconds, and then turn it back on again.

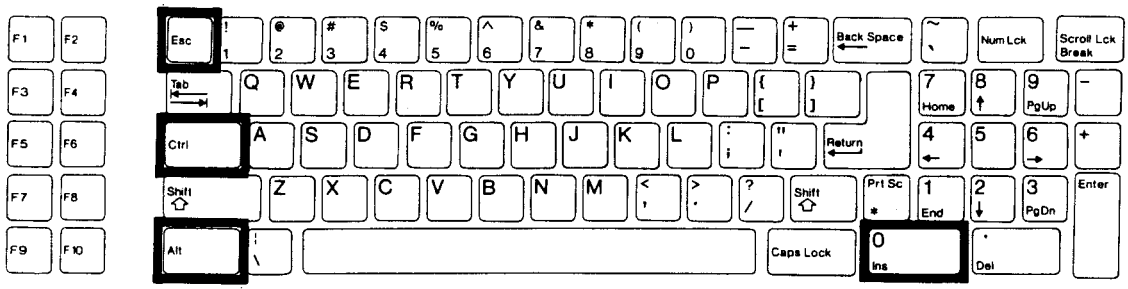


Figure 3-11: Keys to Defeat Autoboot

Chapter 4
Disassembly

This chapter describes the removal of the basic modules of the Z-130 PC Series and Z-140 PC Series Computers.

NOTE: To reassemble the computer, follow the procedure in reverse.

Since this guide covers two different series, the disassembly procedures are grouped according to the computer.

Z-130 PC Series

WARNING: Be sure the power switch is OFF, the line cord is removed, and all peripheral equipment is disconnected before disassembling the computer.

Top Cover

Refer to Figure 4-1.

- Remove the four screws from the top rear portion of the computer.
- Remove the top cover by lifting upward and to the rear of the computer.

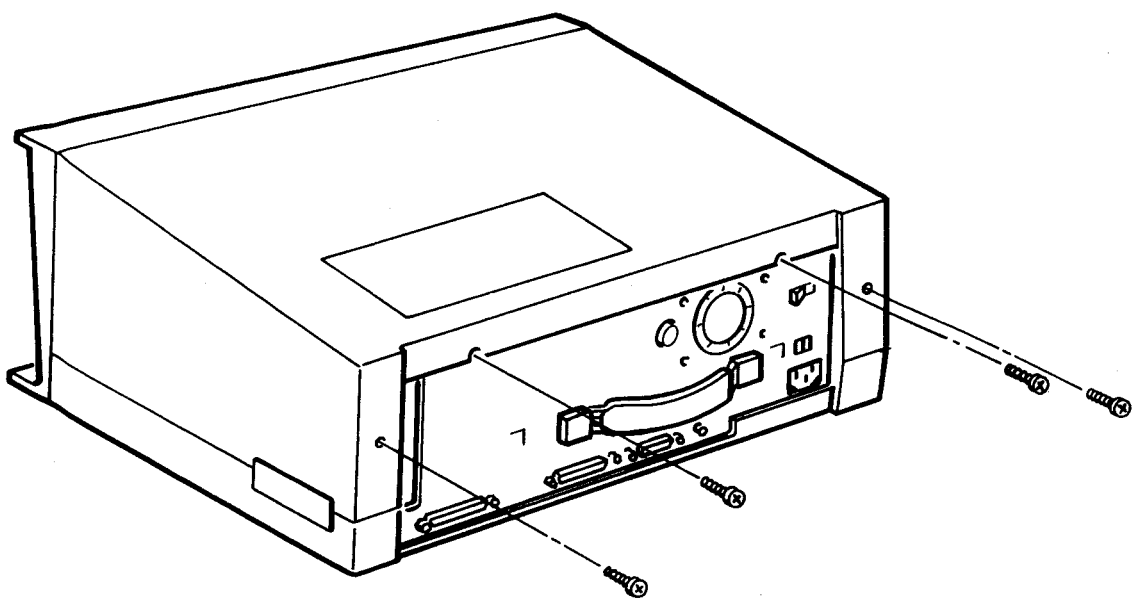


Figure 4-1: Removing the Top Cover

Fan

NOTE: The top cover must be removed before the fan is removed. Unless the fan is being replaced, it is not necessary to remove it before removing any other assembly.

- Refer to Figure 4-2 and disconnect the leads going to the power supply.
- To remove the fan, remove the two screws at **A** that secure the fan to the fan cover.

If you want to remove the fan assembly from the computer, use the following procedure.

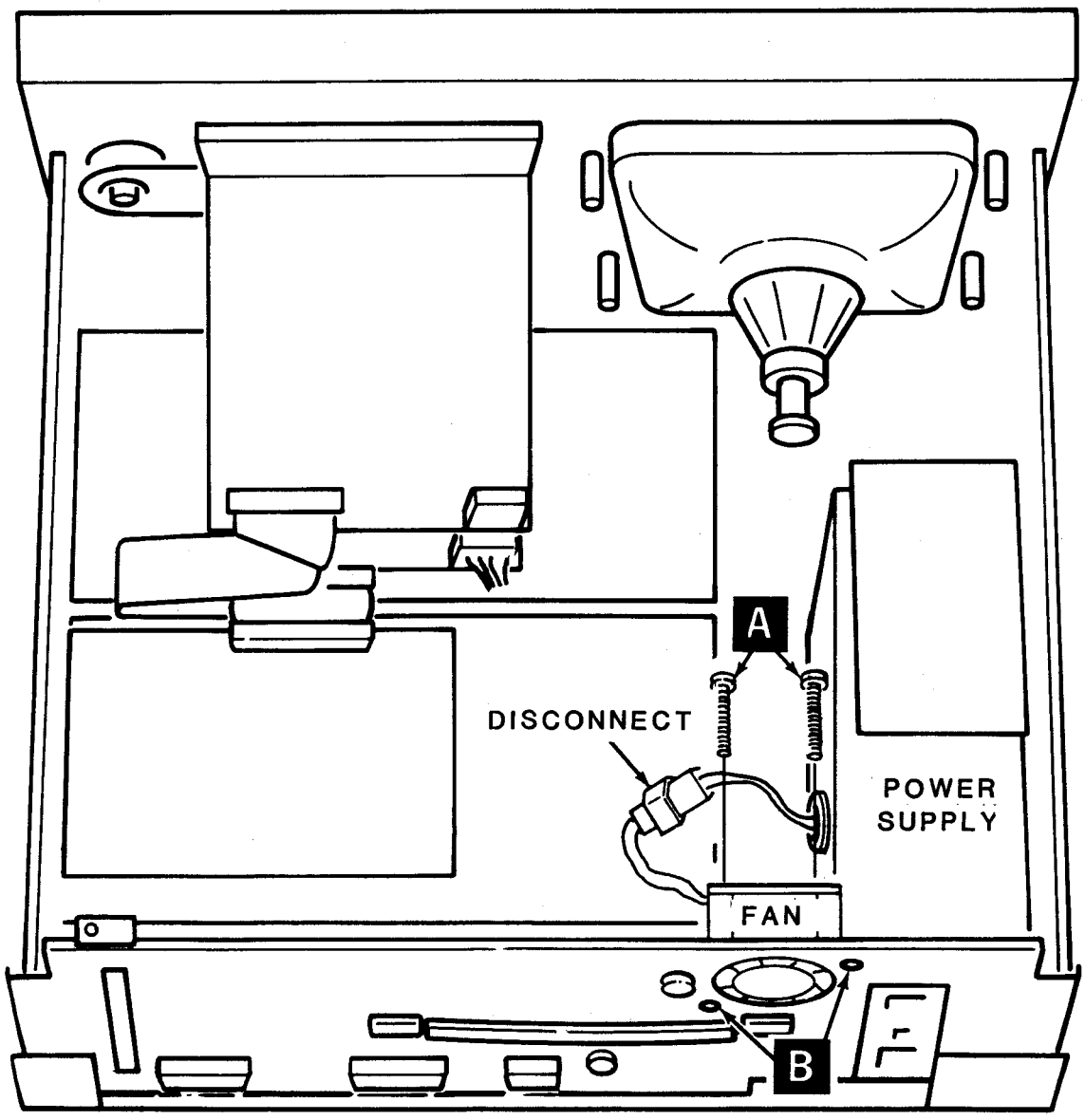


Figure 4-2: Removing the Fan

- Remove the two screws at **B** that secure the fan assembly to the back cover.

- Remove the knob from the brightness control.

- Remove the nut that secures the brightness control to the fan assembly. The brightness control will remain attached to the power supply via connectors.

Power Supply and CRT Section

NOTE: Unless the power supply, the CRT assembly, or one of the CRT modules is being replaced, it is not necessary to remove them. Proceed to Disk Drives and Logic section.

Video Deflection Board

WARNING: Be sure the power switch is OFF, the line cord is removed, and all peripheral equipment is disconnected before disassembling the computer.

NOTE: The top cover must be removed before removing the video deflection board.

The video deflection board is mounted on the top of the power supply. Refer to Figure 4-3 for the following procedure.

- Disconnect the 10-pin cable coming from the power supply and I/O board.

- Disconnect the 6-pin cable coming from the high voltage transformer board.

- Disconnect the white 2-pin cable coming from the CRT yoke assembly.

- Disconnect the black 2-pin cable coming from the CRT yoke assembly.

CAUTION: The CRT socket board plugs onto the pins on the neck of the cathode-ray tube. Use extreme care when you remove or replace this board to avoid damaging the pins on the cathode-ray tube.

- Carefully remove the CRT socket assembly from the CRT.
- Disconnect the black ground wire at the CRT.
- Remove the brightness control from the back panel.
- Remove the mounting screw.
- Gently squeeze each of the two securing clips while lifting the board up.
- Remove the video deflection board.

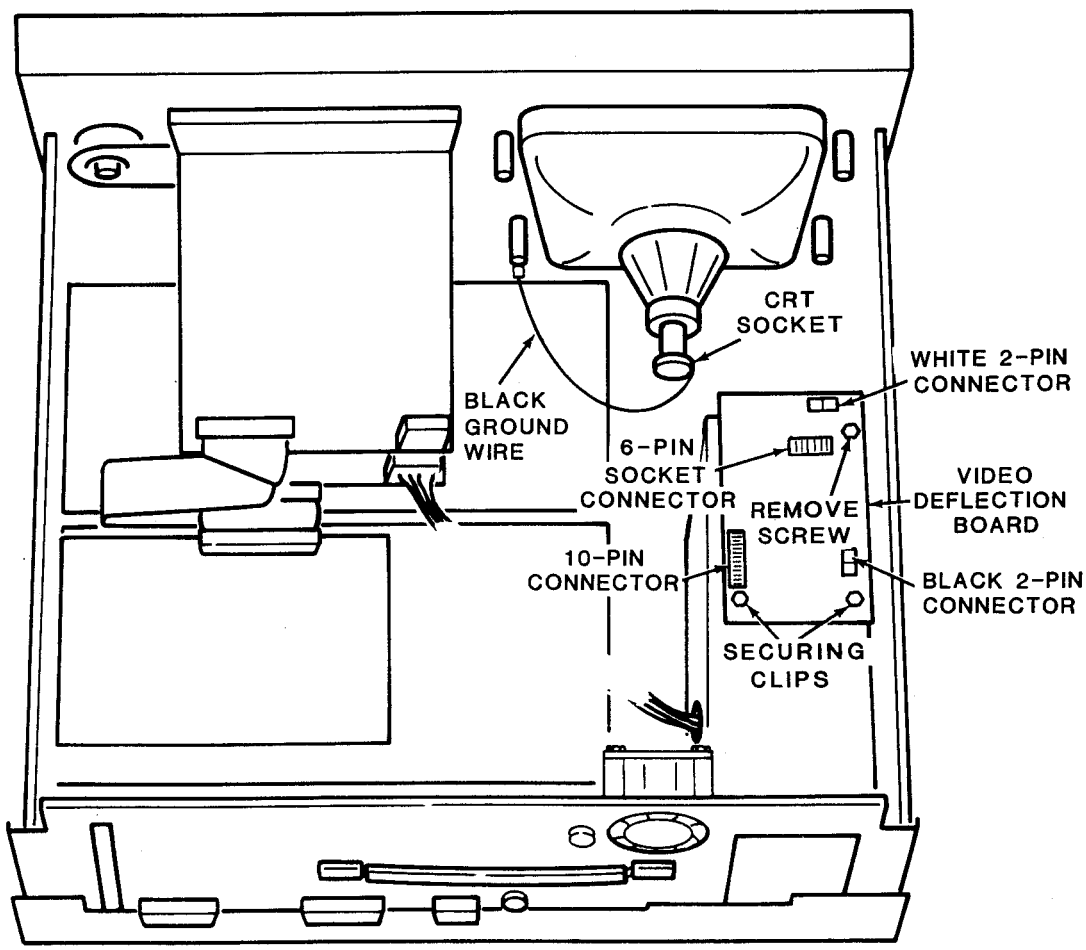


Figure 4-3: Removing the Video Deflection Board

Power Supply

WARNING: Be sure the power switch is OFF, the line cord is removed, and all peripheral equipment is disconnected before disassembling the computer.

NOTE: Remove the top cover and video deflection board assembly before removing the power supply.

Refer to Figure 4-4 to remove the power supply.

- If an interface board is mounted on the input/output board, unplug the power supply cable at P102.
- Unplug the power supply cable on the input/output board at P203.
- Unplug the two power supply cables that connect to the disk drives.
- Unplug the power supply cable on the CPU board at P406.
- Refer to Figure 4-3 and remove the 10-pin connector from the video deflection board. It is attached to a 6-pin connector on the input/output board at P209.
- Remove the 6-pin connector at P209 on the input/output board. It is attached to the brightness control.
- Remove the two screws that retain the fan assembly.
- Remove the four screws that secure the power supply to the chassis. Upon reassembly, make sure the power supply lines up with the four mounting studs before you tighten the mounting screws.
- Remove the power supply and fan assembly.

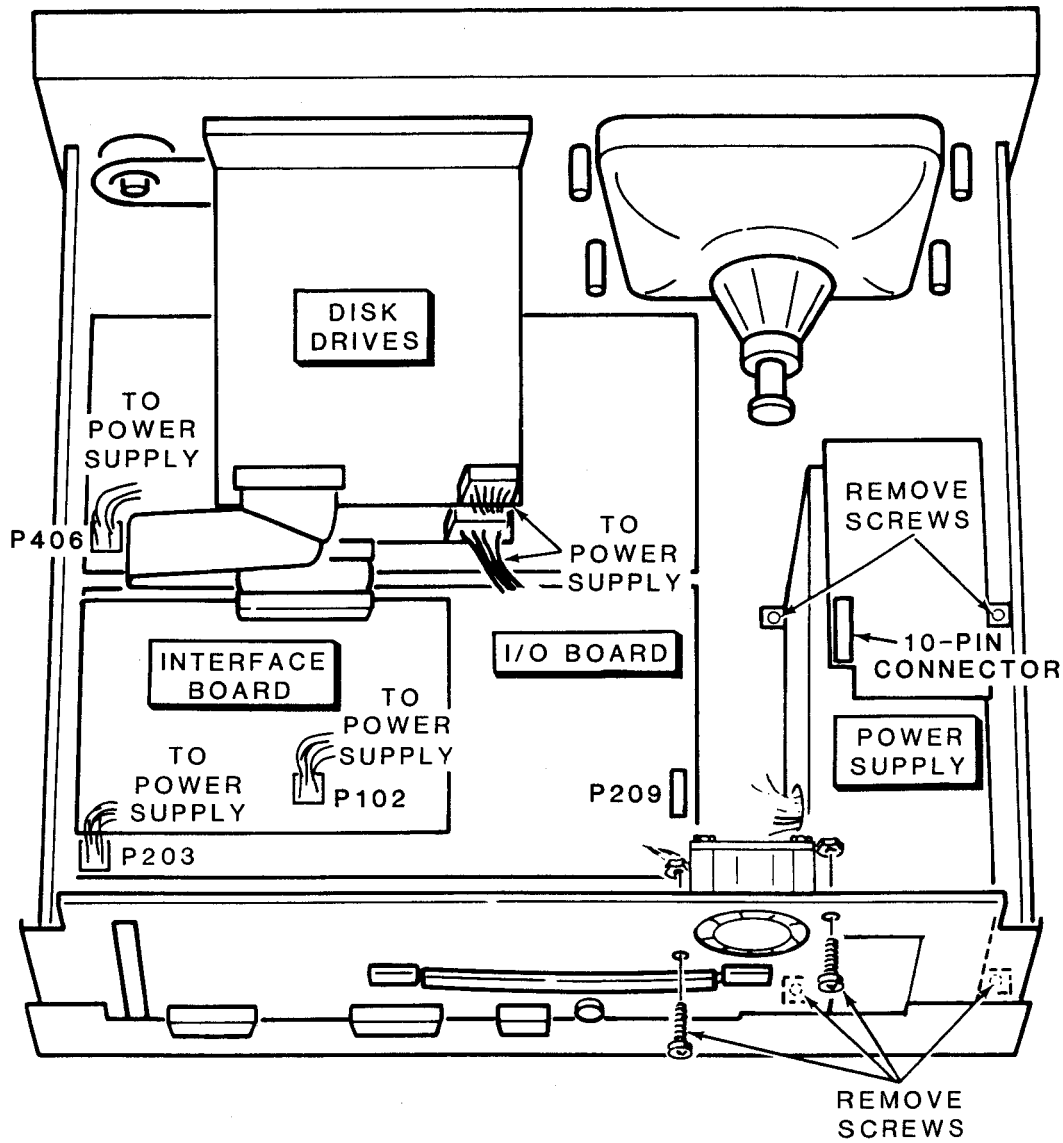


Figure 4-4: Removing the Power Supply

CRT

WARNING: Be sure the power switch is OFF, the line cord is removed, and all peripheral equipment is disconnected before disassembling the computer.

WARNING: Discharge the high voltage anode lead of the cathode-ray tube, using a jumper connected between the chassis and a screwdriver to prevent shock and/or injury.

NOTE: The top cover, video deflection board, and power supply must be removed before removing the CRT.

Refer to Figure 4-5.

- Use a screwdriver with a jumper lead attached between it and the ground lug at the lower-left corner of the CRT and discharge the high voltage anode lead at the CRT as shown in inset #1 of the figure.

- Carefully disconnect the CRT socket board.

- Refer the inset #2 of the figure and disconnect the anode lead from the CRT.

WARNING: Carefully handle the cathode-ray tube when you hold, remove, or install it to prevent implosion and injury.

CAUTION: Do not loosen the two hex-head screws at **C** and **D** that secure the CRT until you are told to do so.

- Remove the two hex-head screws at **A** and **B**.

- Loosen, but do not remove, the hex-head screw at **C**.

- Hold the CRT with one hand, and carefully loosen the hex head screw at **D**; then carefully slide the CRT assembly from behind the screws at **C** and **D**.

- Set the CRT down on a padded work area so the front surface of the glass is not scratched.

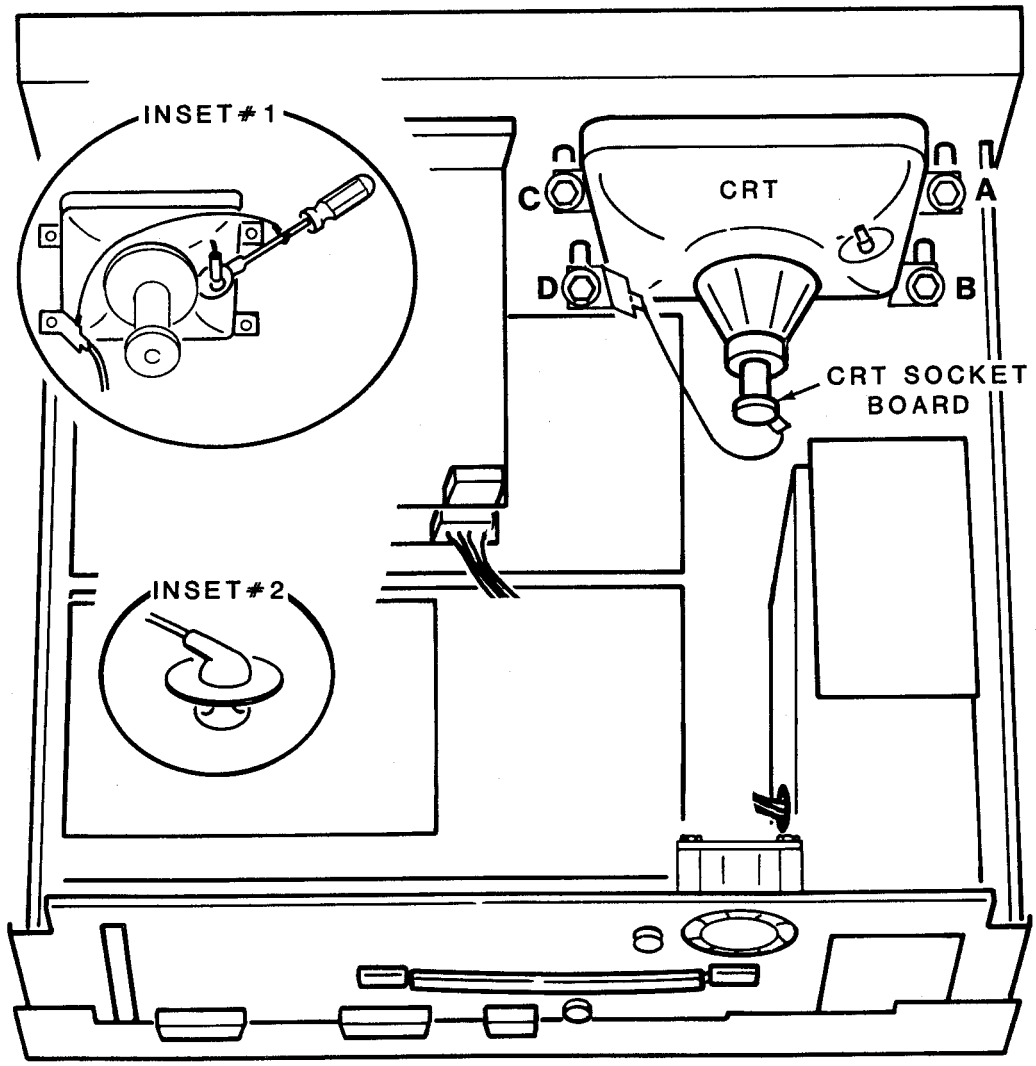


Figure 4-5: Removing the CRT

High Voltage Transformer Assembly

WARNING: Be sure the power switch is OFF, the line cord is removed, and all peripheral equipment is disconnected before disassembling the computer.

NOTE: The top cover, video deflection board, power supply, and CRT must be removed before removing the high voltage transformer assembly.

- Refer to Figure 4-6 and remove the two screws that secure the high voltage transformer assembly to the chassis.

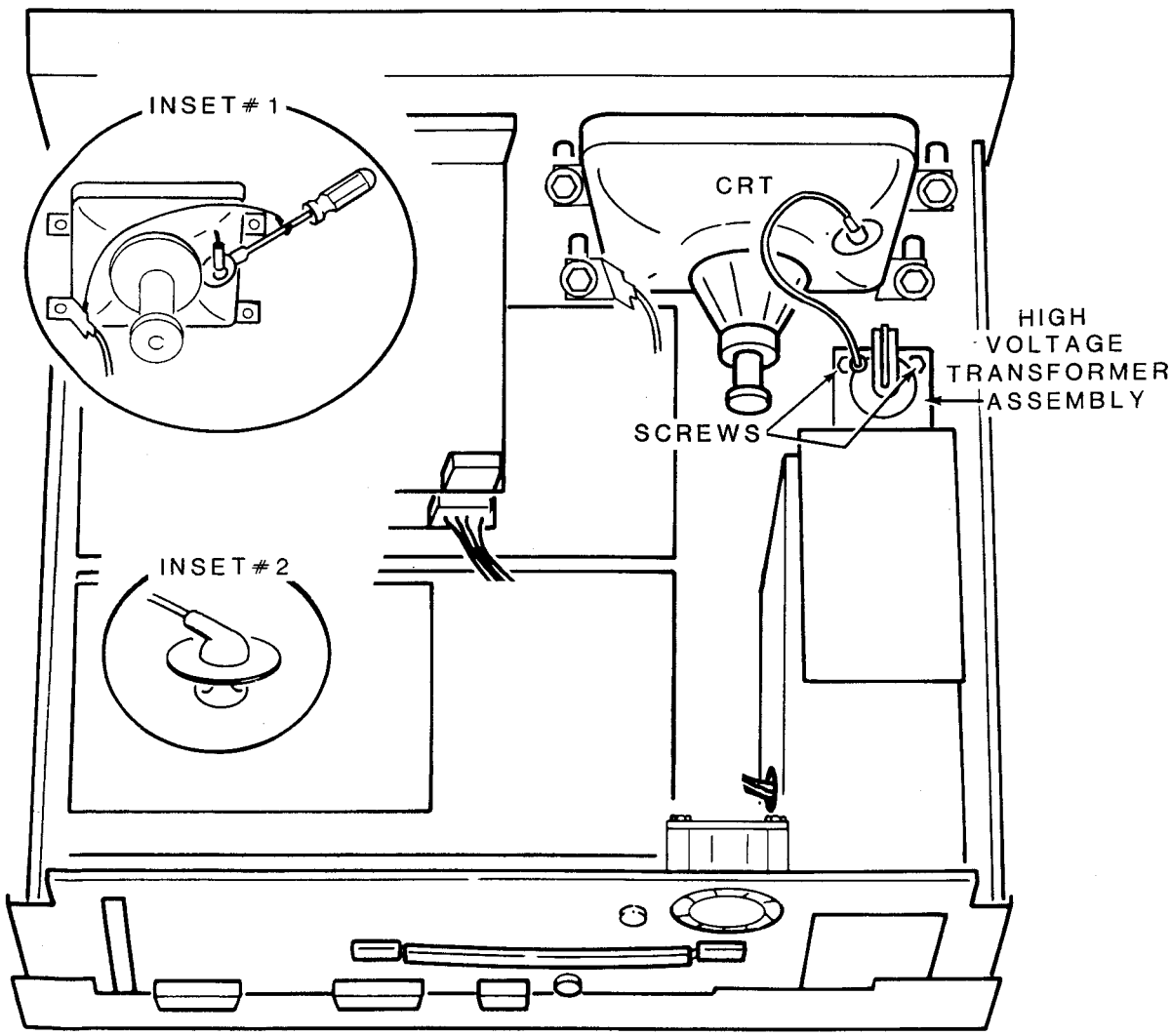


Figure 4-6: Removing the High Voltage Transformer Assembly

Disk Drives and Logic Section

WARNING: Be sure the power switch is OFF, the line cord is removed, and all peripheral equipment is disconnected before disassembling the computer.

Disk Drive Assembly

NOTE: The top cover must be removed before removing the disk drive assembly.

Refer to Figure 4-7.

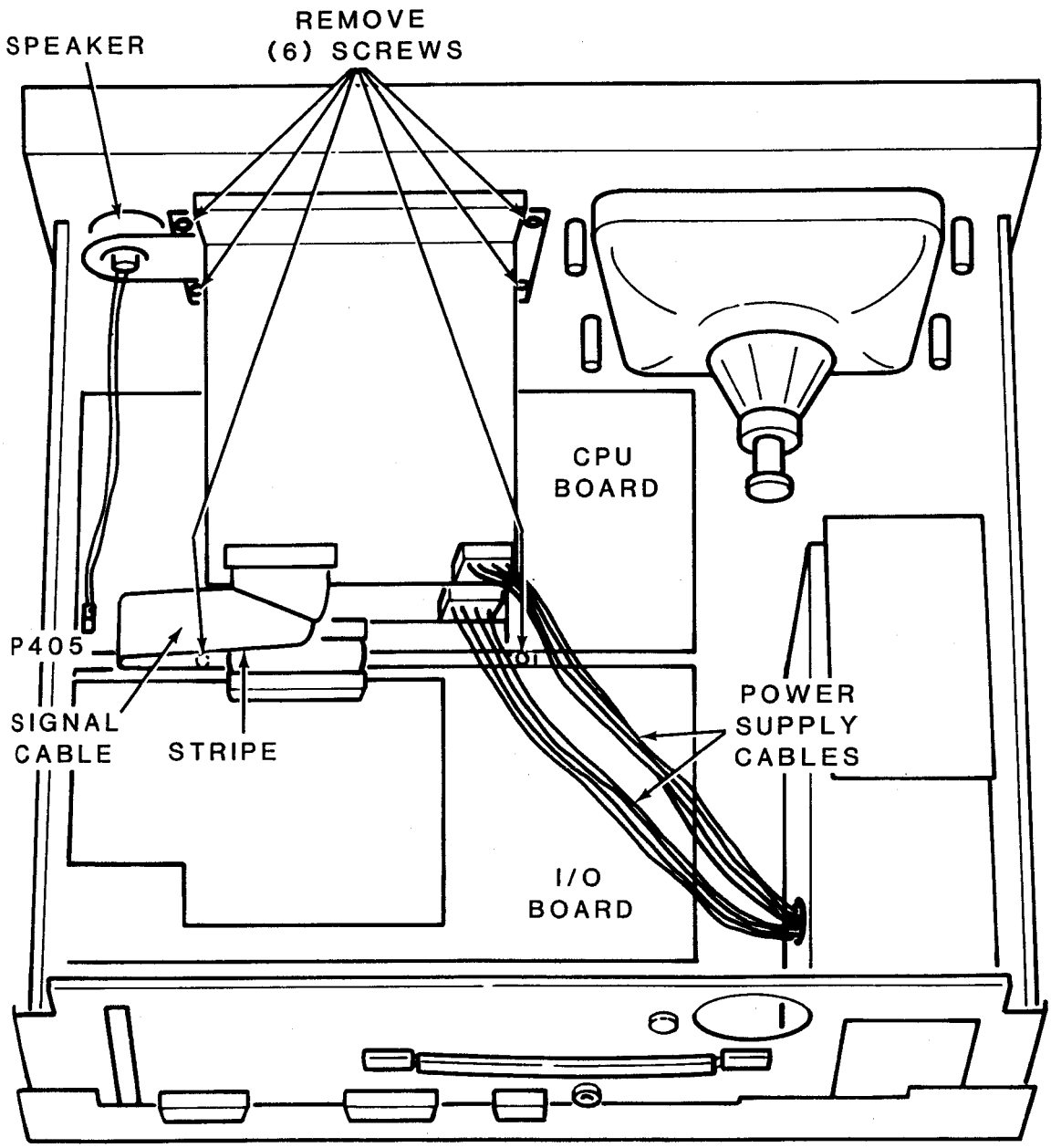


Figure 4-7: Removing the Disk Drive Assembly

- Disconnect the power supply connector(s) from the rear of the disk drive(s).

- Remove the disk drive control signal cable at connector P201 located on the input/output board. The striped end of the control cable should be oriented toward the side of the computer as shown in the figure.

- Remove the speaker connector at P405 located on the CPU board.

- Remove the four screws that secure the disk drive bracket assembly to the front bezel of the computer and two screws that anchor the rear portion of the drive bracket assembly to the chassis.

- Carefully lift the disk drive assembly slightly upward and to the rear to clear the front bezel.

Disk Drives

NOTE: The top cover and disk drive assembly must be removed from the computer before either disk drive can be removed.

Refer to Figure 4-8.

NOTE: The top disk drive is identified as drive A and the bottom disk drive is drive B. If only one floppy disk drive is installed, it is drive A.

- Remove the ribbon cable from each drive.

NOTE: Either drive can be removed independently of the other. Programming the jumpers on the drive are covered in Chapter 5, "Configuration."

- Drive A: Remove the four screws at **A** from the drive assembly. Remove the drive from between the two brackets.

- Drive B: Remove the four screws at **B** from the drive assembly. Slide the drive forward to remove it from between the two brackets.

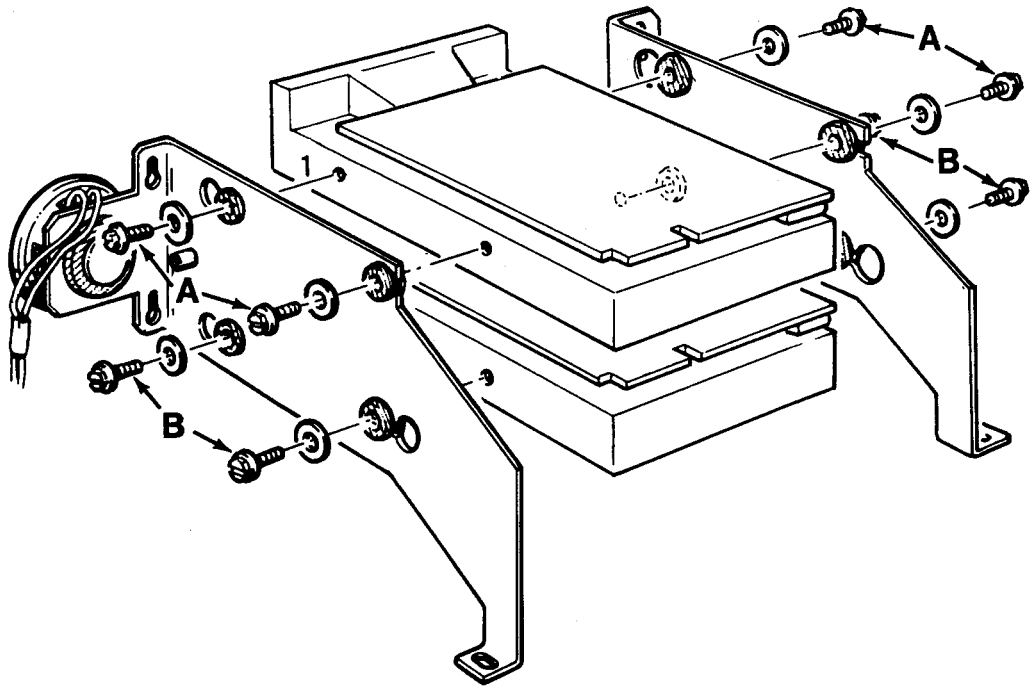


Figure 4-8: Removing the Disk Drives

Optional PC-Compatible Card

WARNING: Be sure the power switch is OFF, the line cord is removed, and all peripheral equipment is disconnected before disassembling the computer.

NOTE: Some computers will not have either the interface board or an optional PC-compatible card installed.

NOTE: The top cover must be removed before removing a PC-compatible card from the computer.

- Refer to Figure 4-9 and remove the screw that secures the card bracket to the back panel of the computer.

CAUTION: Many integrated circuits on computer cards and boards are electrostatic-sensitive and can be damaged by static electricity if they are handled improperly. Once a card or board is removed from the computer or its protective packaging, **do not** lay it down or let go of it until it is either reinstalled in the computer or placed in protective packaging.

- Carefully lift the card straight up and out of the computer.

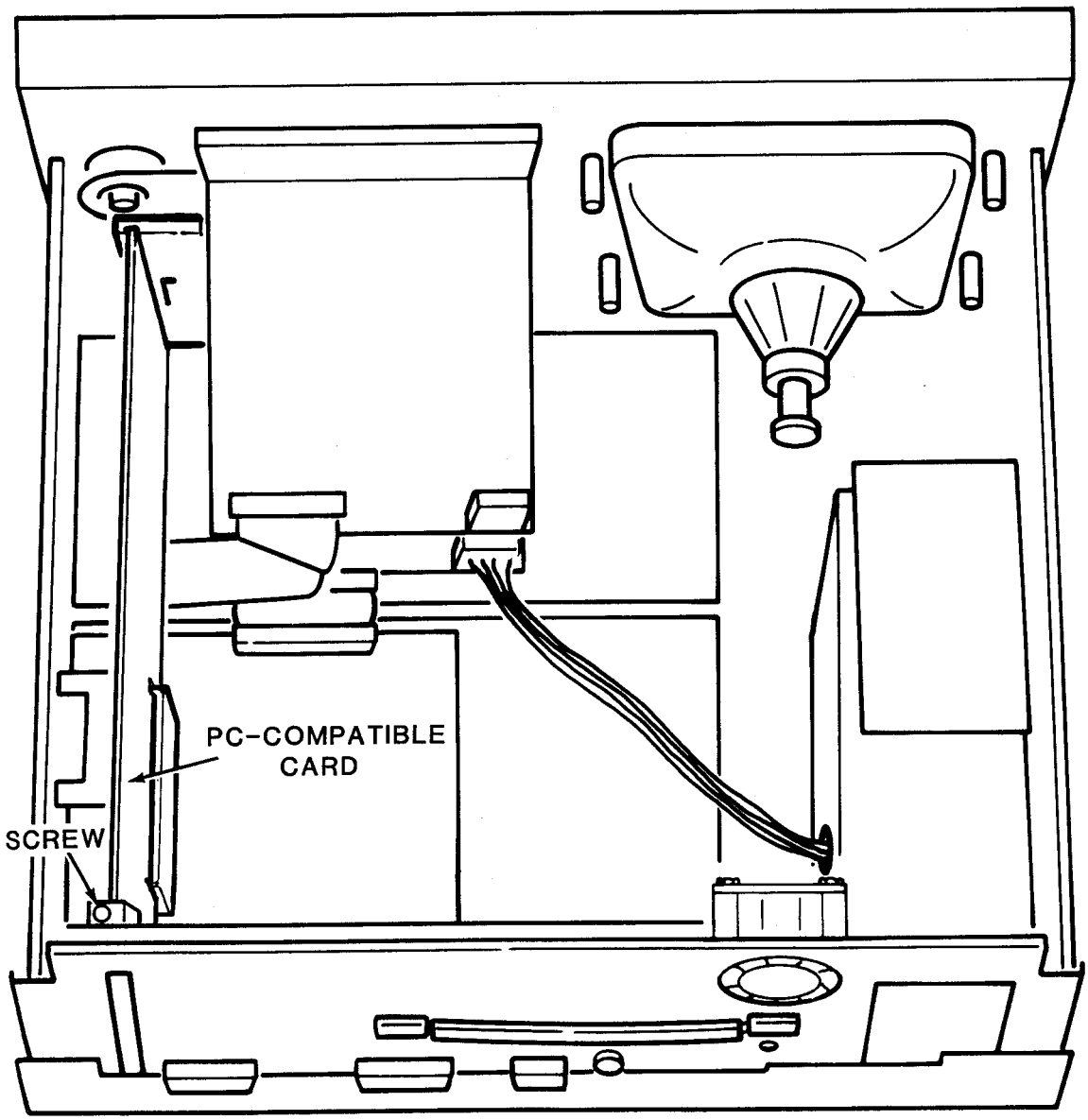


Figure 4-9: Removing the PC-Compatible Card

Interface Board

One of several slightly different interface boards may be used in the Z-130 Series Computers. It may have provisions for accepting an option operating system on ROM, an optional IBM-compatible card, and/or an expansion chassis connector.

CAUTION: Many integrated circuits on computer cards and boards are electrostatic-sensitive and can be damaged by static electricity if they are handled improperly. Once a card or board is removed from the computer or its protective packaging, **do not** lay it down or let go of it until it is either reinstalled in the computer or placed in protective packaging.

NOTE: The top cover, the optional PC-compatible card, and the optional expansion chassis interface cable must be removed before removing the interface board.

Refer to Figure 4-10.

- Unplug the interconnecting cable from the interface board.
- Unplug the power supply cable from the interface board.
- Remove the four screws that retain the interface board.
- Remove the board from the computer.

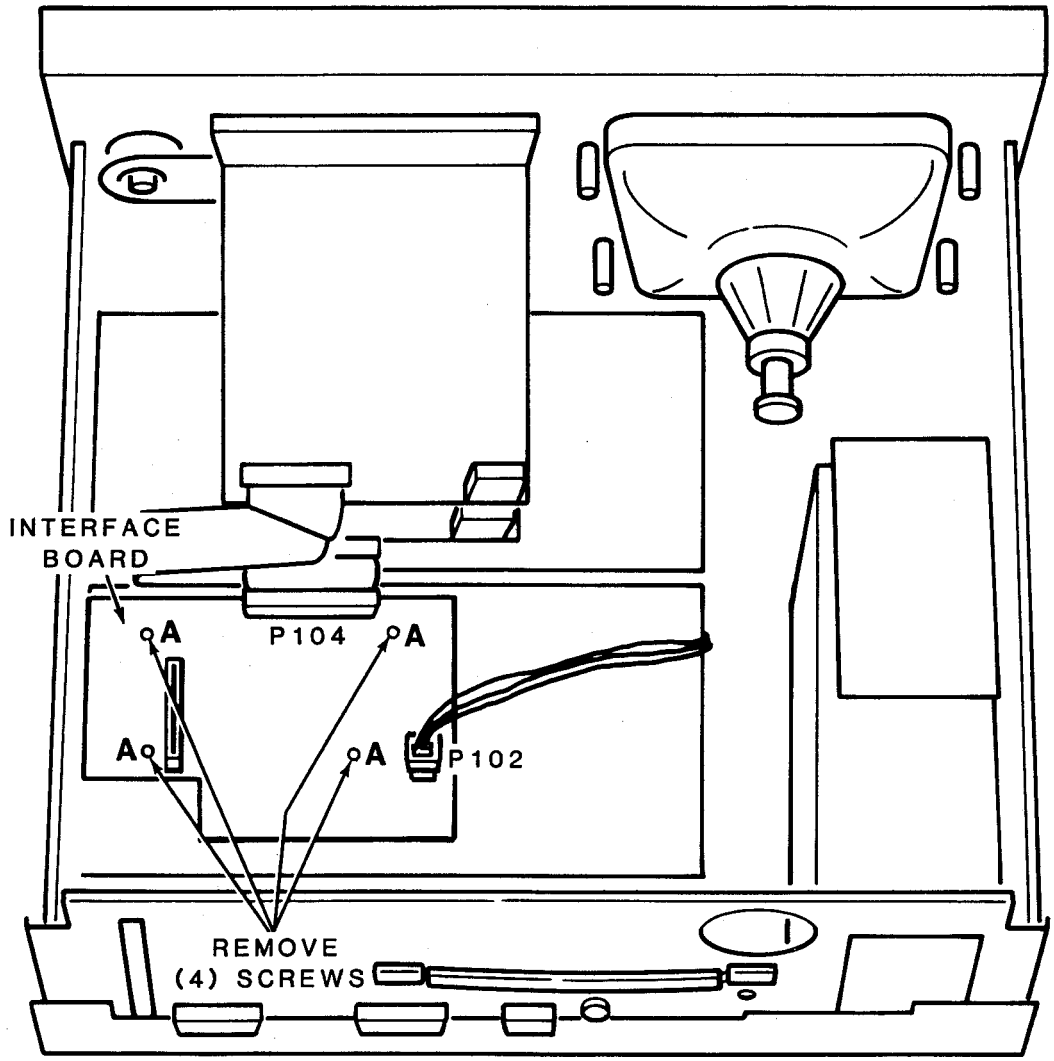


Figure 4-10: Removing the Interface Board

CPU Board

WARNING: Be sure the power switch is OFF, the line cord is removed, and all peripheral equipment is disconnected before disassembling the computer.

CAUTION: Many integrated circuits on computer cards and boards are electrostatic-sensitive and can be damaged by static electricity if they are handled improperly. Once a card or board is removed from the computer or its protective packaging, **do not** lay it down or let go of it until it is either reinstalled in the computer or placed in protective packaging.

NOTE: The top cover, disk drive assembly, optional PC-compatible card, and interface board must be removed before the CPU board can be removed from the computer.

Refer to Figure 4-11.

- Unplug the interconnecting cable from the CPU board.
- Unplug the power supply cable at P406.
- Remove two screws at **A**. Lift the back of the CPU board and carefully guide it upward and to the rear of the computer.

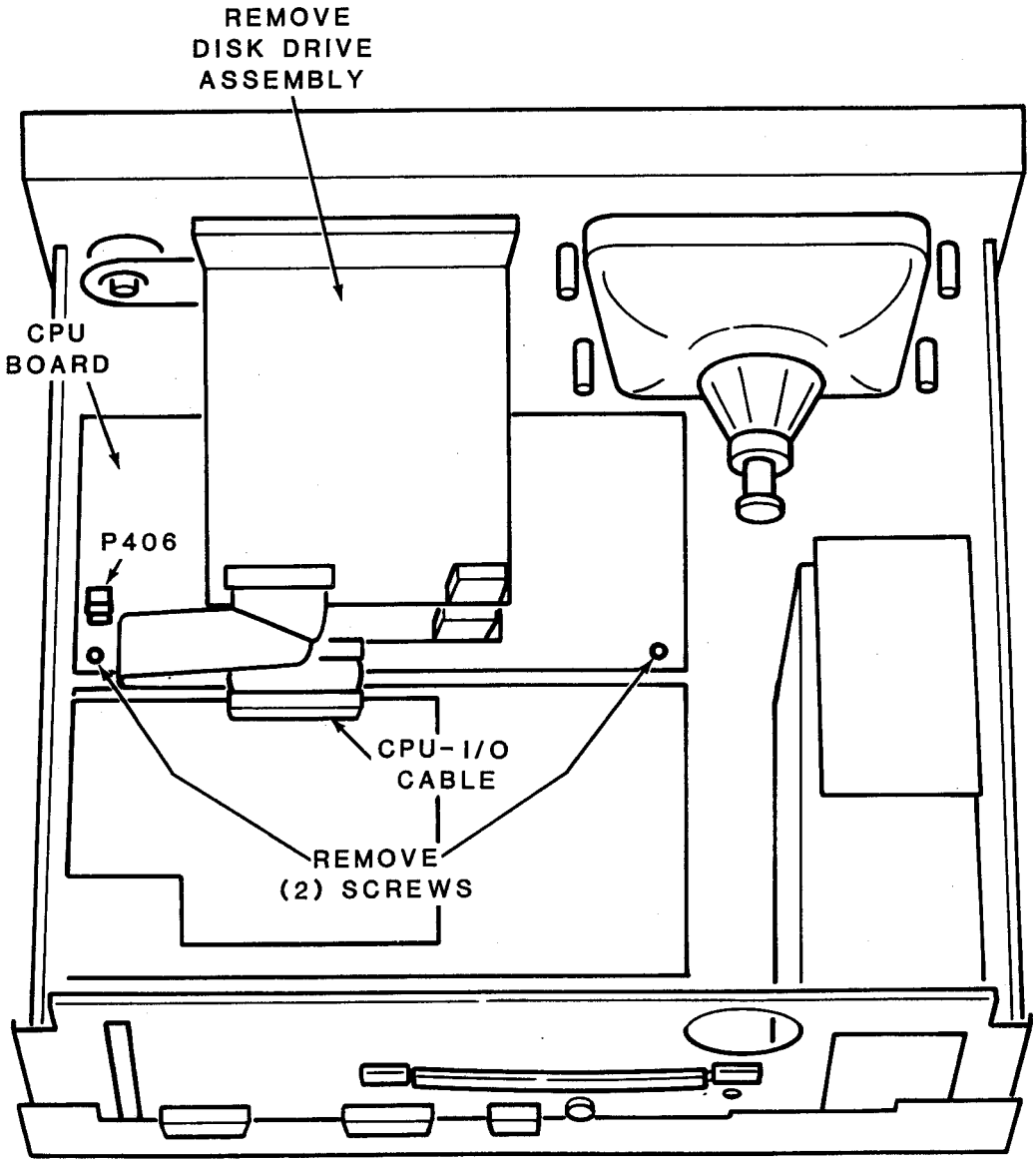


Figure 4-11: Removing the CPU Board

Input/Output Board

WARNING: Be sure the power switch is OFF, the line cord is removed, and all peripheral equipment is disconnected before disassembling the computer.

CAUTION: Many integrated circuits on computer cards and boards are electrostatic-sensitive and can be damaged by static electricity if they are handled improperly. Once a card or board is removed from the computer or its protective packaging, do not lay it down or let go of it until it is either reinstalled in the computer or placed in protective packaging.

NOTE: The top cover, fan, disk drive assembly, optional PC-compatible card, and interface board must be removed before the input/output board can be removed from the computer.

Refer to Figure 4-12.

- Unplug the interconnecting cable from the input/output board if the CPU board has not been removed.
- Unplug the power connector at P203.
- Unplug the video cable at P209.
- Remove the two hex nuts that secure the parallel connector P204 to the back panel.
- Remove the two hex nuts that secure the serial connector P206 to the back panel.
- Remove the two hex nuts that secure the RGB connector P207 to the back panel.
- Remove the two screws that secure the back of the input/output board to the back panel.
- Remove either:

— the four spacer posts to which the interface board was mounted.
— the four screws from the input/output board.

- Lift the front of the input/output board up and guide it out of the computer.

Mechanical

NOTE: The top case, all parts of the power supply and CRT section, and all parts of the disk drives and logic section must be removed before further disassembly. Refer to the exploded view in the Z-130 Schematics and Parts List (a separate publication) to disassemble the remainder of the computer's frame and chassis.

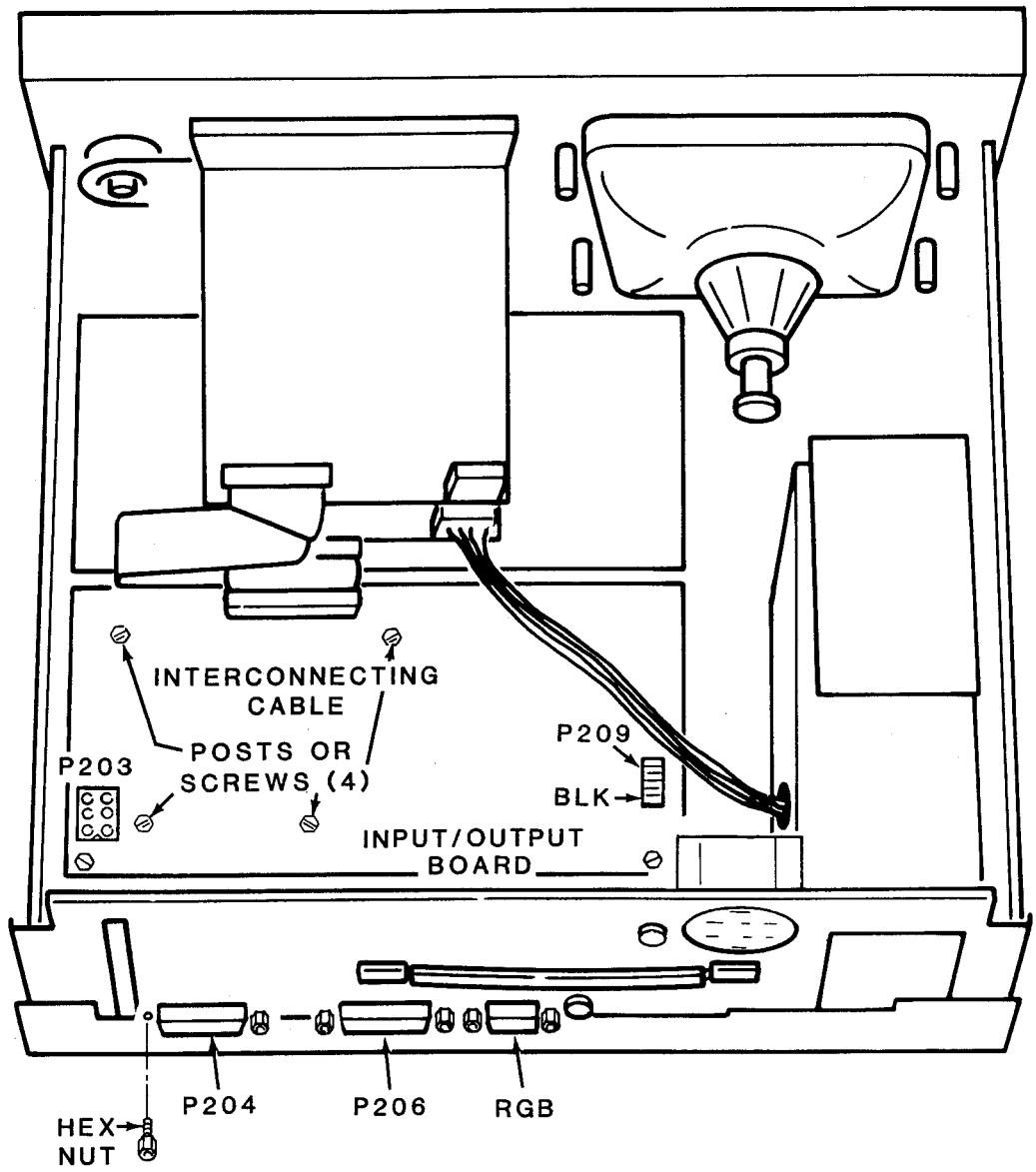


Figure 4-12: Removing the Input/Output Board

Z-140 PC Series

WARNING: Be sure the power switch is OFF, the line cord is removed, and all peripheral equipment is disconnected before disassembling the computer.

Top Cover

Refer to Figure 4-13.

- Remove the two screws from the top rear portion of the computer.
- Remove the top cover by lifting upward and to the rear of the computer.

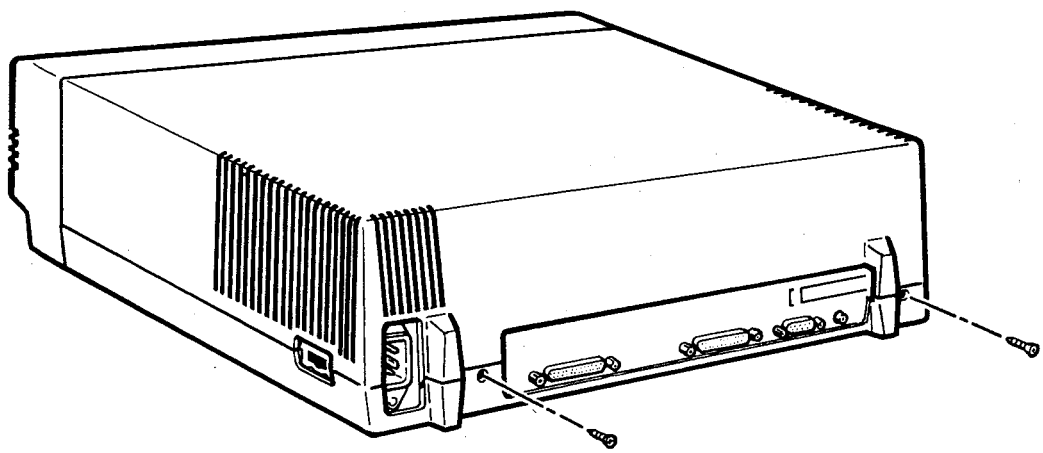


Figure 4-13: Removing the Top Cover

Disk Drive Assembly

WARNING: Be sure the power switch is OFF, the line cord is removed, and all peripheral equipment is disconnected before disassembling the computer.

NOTE: The top cover must be removed before removing the disk drives.

Refer to Figure 4-14.

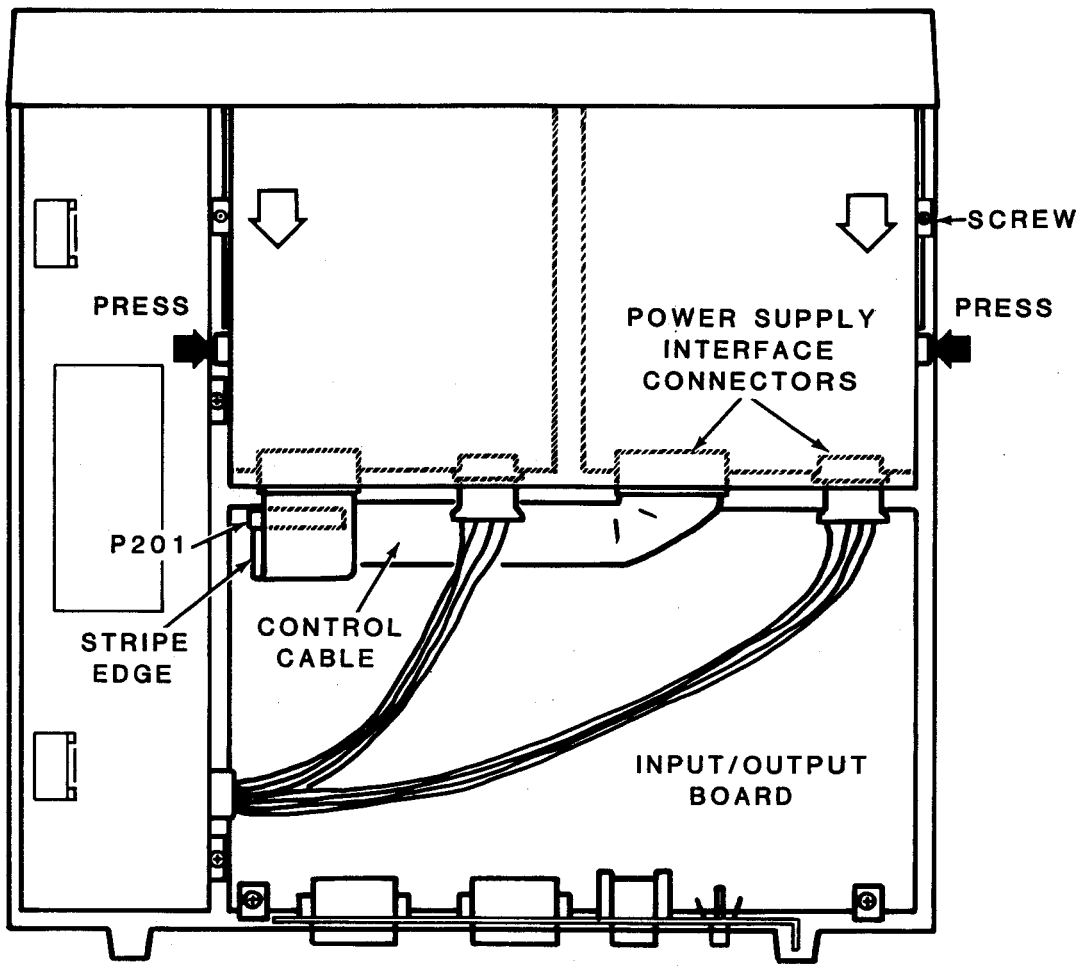


Figure 4-14: Removing the Disk Drive Assembly

- Remove the power cables from the rear of the disk drive(s).

- Remove the flat ribbon cable at connector P201 located on the input/output board. The striped end of the control cable should be oriented toward the side of the computer.

- Remove the two screws that secure the disk drive bracket assembly to the base of the computer.

- Press the two retaining tabs and slide the disk drive assembly to the back. Lift the assembly up and out of the computer.

Disk Drives

NOTE: The top cover and disk drive assembly must be removed from the computer before either disk drive may be removed.

Refer to Figure 4-15.

NOTE: The left disk drive is identified as drive A and the right disk drive is drive B. If only one floppy disk drive is installed, it is drive A.

- Remove the four screws at **A** and remove the disk drive cover. The disk drive cover must be installed in all Z-140 PC computers to prevent disk drive to video monitor interference and vice versa.

- Remove the ribbon cable from each drive.

NOTE: Either drive can be removed independently of the other. Programming the jumpers on the drive are covered in Chapter 5, "Configuration."

- Drive A: Remove the four screws at **D** from the drive assembly. Remove the drive from the bracket.

- Drive B: Remove the four screws at **C** from the drive assembly. Remove the drive from the bracket.

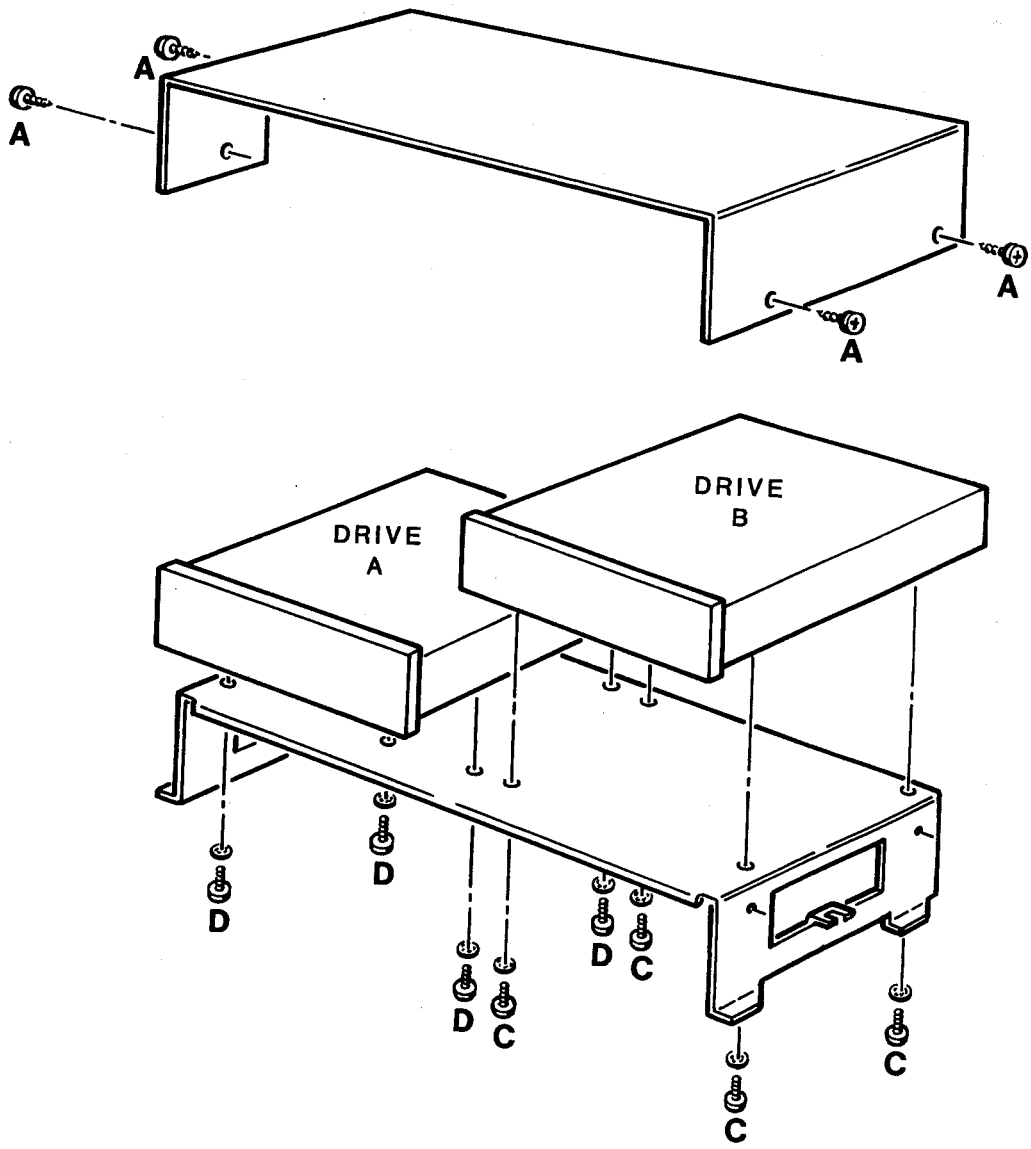


Figure 4-15: Removing the Disk Drives

PC-Compatible Card

WARNING: Be sure the power switch is OFF, the line cord is removed, and all peripheral equipment is disconnected before disassembling the computer.

NOTE: Some computers will not have either the interface board or an optional PC-compatible card installed.

NOTE: The top cover and disk drives must be removed before installing or removing a PC-compatible card from the computer.

- Refer to Figure 4-16 and remove the screw that secures the card bracket to the back panel of the computer.

CAUTION: Many integrated circuits on computer cards and boards are electrostatic-sensitive and can be damaged by static electricity if they are handled improperly. Once a card or board is removed from the computer or its protective packaging, **do not** lay it down or let go of it until it is either reinstalled in the computer or placed in protective packaging.

- Carefully slide the card out of the card socket at P101 on the interface board and lift the card out of the computer.

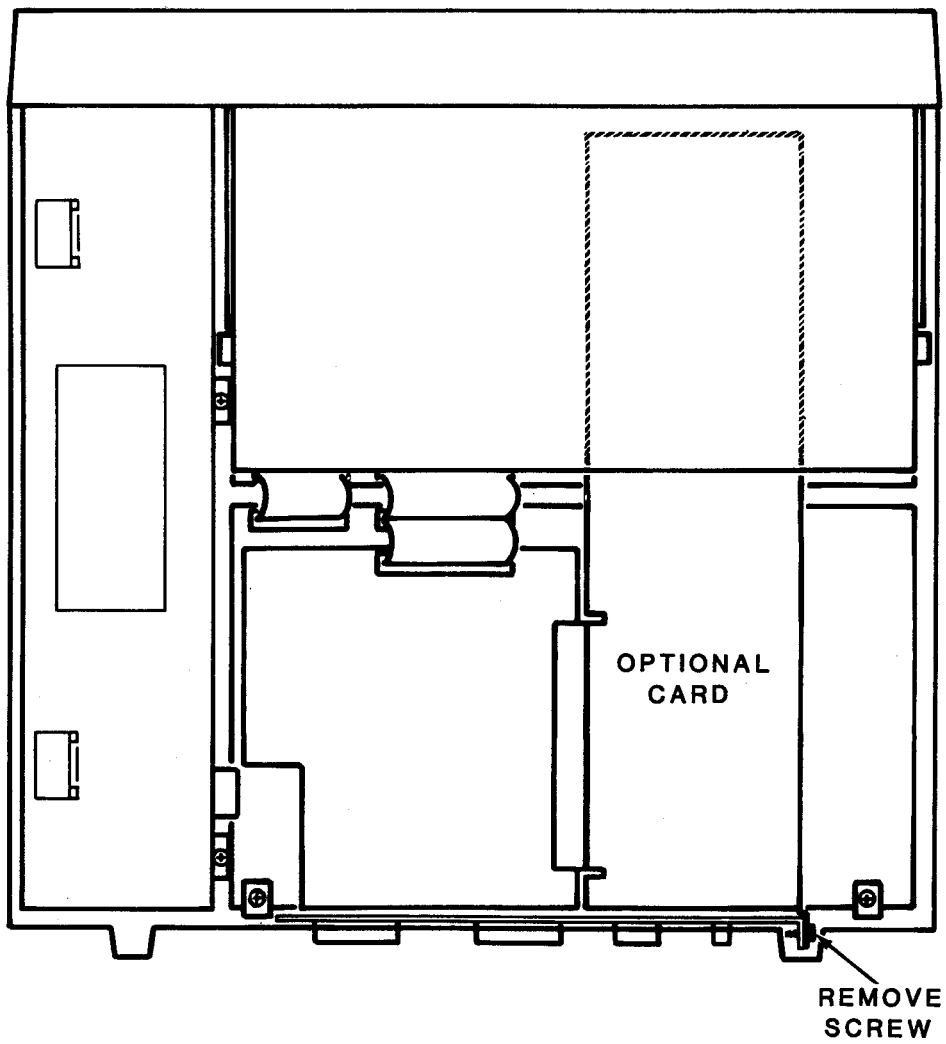


Figure 4-16: Removing the PC-Compatible Card

Interface Board

One of several slightly different interface boards may be used in the Z-140 PC Series computers. It may have provisions for accepting an optional operating system on ROM, an optional IBM-compatible card, and/or an expansion chassis connector.

CAUTION: Many integrated circuits on computer cards and boards are electrostatic-sensitive and can be damaged by static electricity if they are handled improperly. Once a card or board is removed from the computer or its protective packaging, **do not** lay it down or let go of it until it is either reinstalled in the computer or placed in protective packaging.

NOTE: The top cover, the optional PC-compatible card, and the optional expansion chassis interface cable must be removed before removing the interface board.

Refer to Figure 4-17.

- Unplug the interconnecting cable from the interface board at P104.
- Unplug the power supply cable from the interface board at P102.
- The interface board is secured by four plastic clips as shown in the figure. To release the board, squeeze each clip while gently lifting the board up.
- Make sure all four clips have released the board and then remove the board from the computer.

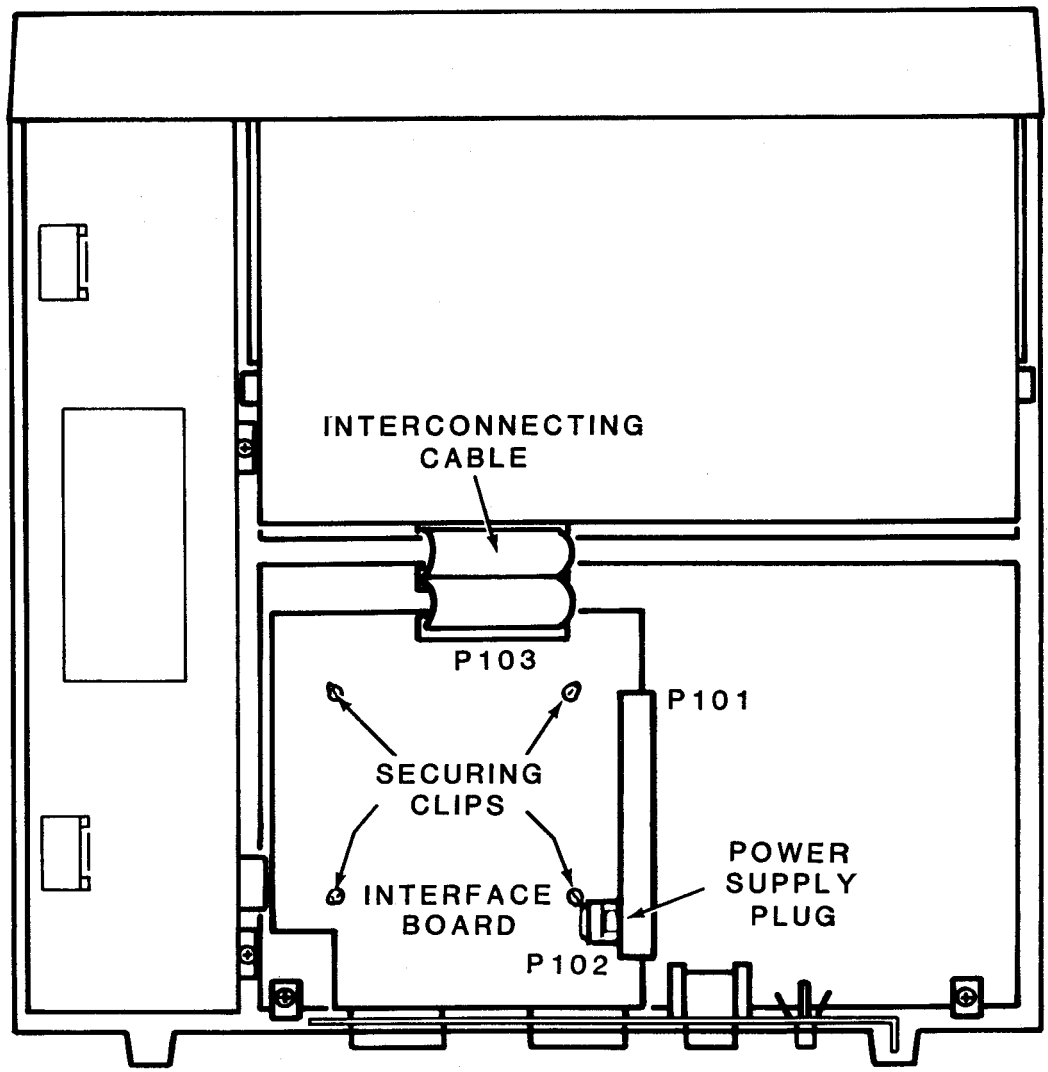


Figure 4-17: Removing the Interface Board

CPU Board

WARNING: Be sure the power switch is OFF, the line cord is removed, and all peripheral equipment is disconnected before disassembling the computer.

CAUTION: Many integrated circuits on computer cards and boards are electrostatic-sensitive and can be damaged by static electricity if they are handled improperly. Once a card or board is removed from the computer or its protective packaging, **do not** lay it down or let go of it until it is either reinstalled in the computer or placed in protective packaging.

NOTE: The top cover, disk drive assembly, optional PC-compatible card, and interface board must be removed before the CPU board can be removed from the computer.

Refer to Figure 4-18.

- Unplug the interconnecting cable from the CPU board.
- Unplug the power supply cable at P406 on the CPU board.
- Unplug the speaker connector at P405 located on the CPU board.
- Remove one screw at **A**.
- Two latches retain the CPU board. Press them toward the back as you lift on the CPU board until it is clear. Guide the card toward the back of the computer as you remove it.

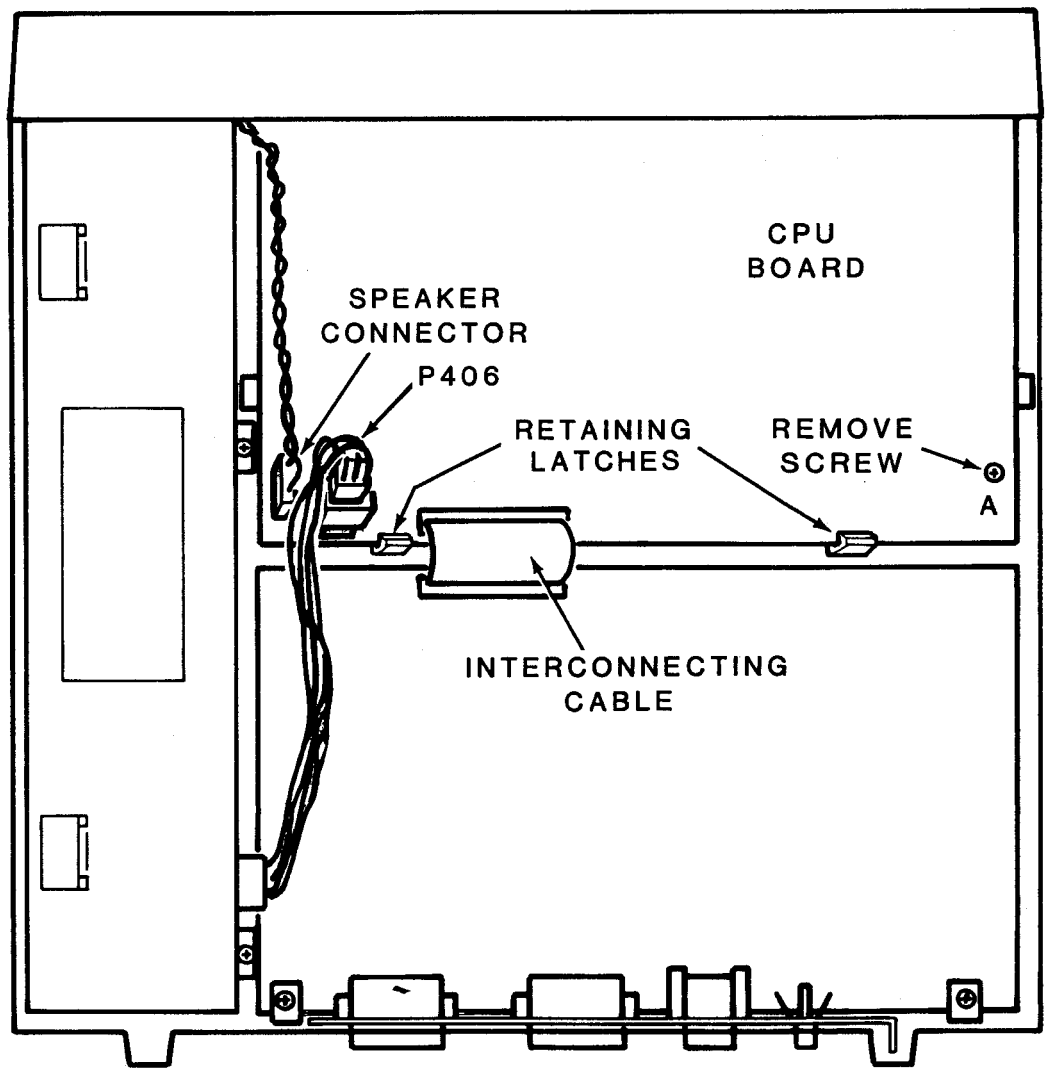


Figure 4-18: Removing the CPU Board

Input/Output Board

WARNING: Be sure the power switch is OFF, the line cord is removed, and all peripheral equipment is disconnected before disassembling the computer.

CAUTION: Many integrated circuits on computer cards and boards are electrostatic-sensitive and can be damaged by static electricity if they are handled improperly. Once a card or board is removed from the computer or its protective packaging, **do not** lay it down or let go of it until it is either reinstalled in the computer or placed in protective packaging.

NOTE: The top cover, disk drive assembly, optional PC-compatible card, and interface board must be removed before the input/output board can be removed from the computer.

Refer to Figure 4-19.

- Unplug the interconnecting cable from the input/output board if the CPU board has not been removed.
- Unplug the power connector at P203.
- Remove the two hex nuts that secure the parallel connector P204 to the back panel.
- Remove the two hex nuts that secure the serial connector P206 to the back panel.
- Remove the two hex nuts that secure the RGB connector P207 to the back panel.
- Remove the two screws that secure the back of the input/output board to the back panel.
- Two latches retain the input/output board to the computer base. Press them toward the front of the computer as you lift on the input/output board until it is clear.
- Lift the front of the input/output board up and guide it out of the computer.

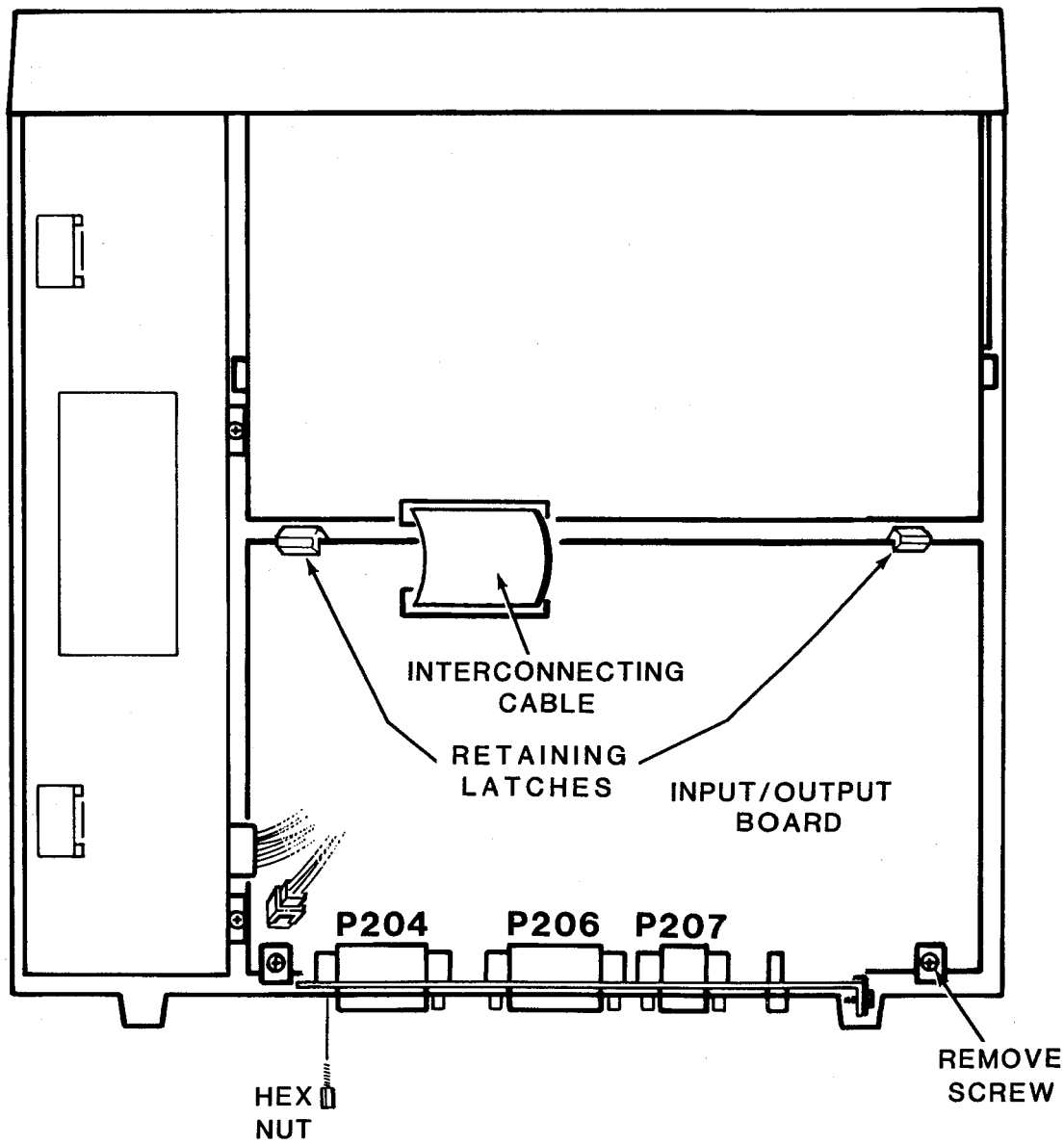


Figure 4-19: Removing the Input/Output Board

Power Supply

WARNING: Be sure the power switch is OFF, the line cord is removed, and all peripheral equipment is disconnected before disassembling the computer.

NOTE: The top case must be removed before removing the power supply.

- Unplug the power supply cable from P102 of the interface board.
- Unplug the power supply cable from P406 of the CPU board.
- Unplug the power supply cable from P203 of the input/output board.
- Unplug the speaker cable at P405 of the CPU board.
- Unplug the power supply cable from each disk drive.
- Unplug the power supply cable at P102 of the interface board if it is present.
- Remove the two screws that secure the power supply to the base.
- Slide the power supply to the front of the computer so that the power supply flanges clear the base flanges. A power supply flange, positioned under the back panel flange when it is secured in the computer, will also clear.
- As you remove the power supply from the computer, slide the power indicator out of the holder in the front panel.

Keyboard

Keyboard disassembly is not provided; if it is determined that the keyboard is defective, it should be replaced as a unit.

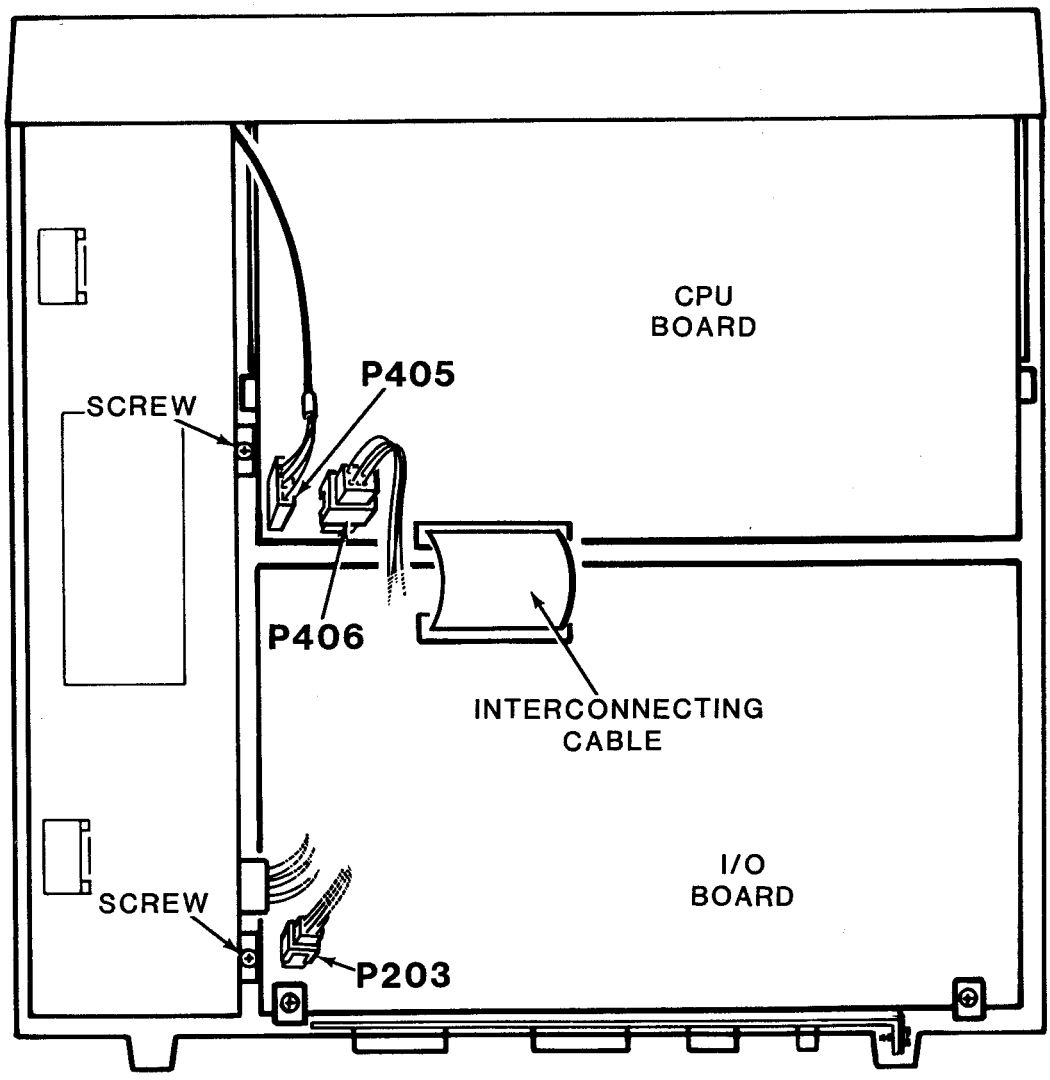


Figure 4-20: Removing the Power Supply

Chapter 5
Configuration

Since many different cards and options can be installed into the Z-130 PC Series and Z-140 PC Series Computers, the system must be configured for a variety of different combinations. This chapter describes how to configure the switches and jumpers.

Figures 5-1 (Z-130 PC Series) and 5-2 (Z-140 PC Series) show the location of all the boards in the system. Refer to these figures to locate each of the boards to be configured.

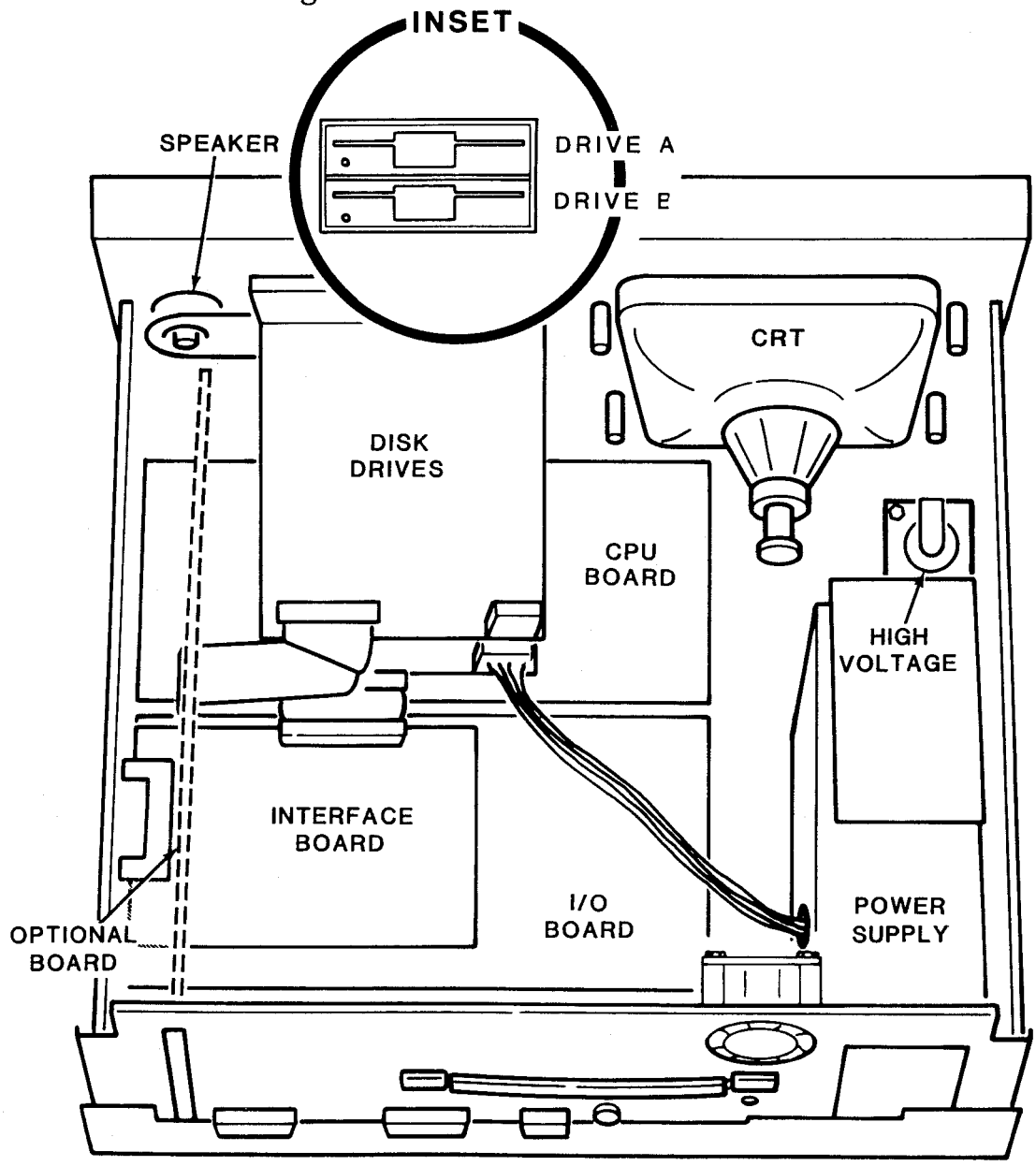


Figure 5-1: Z-130 PC Series Board Locations

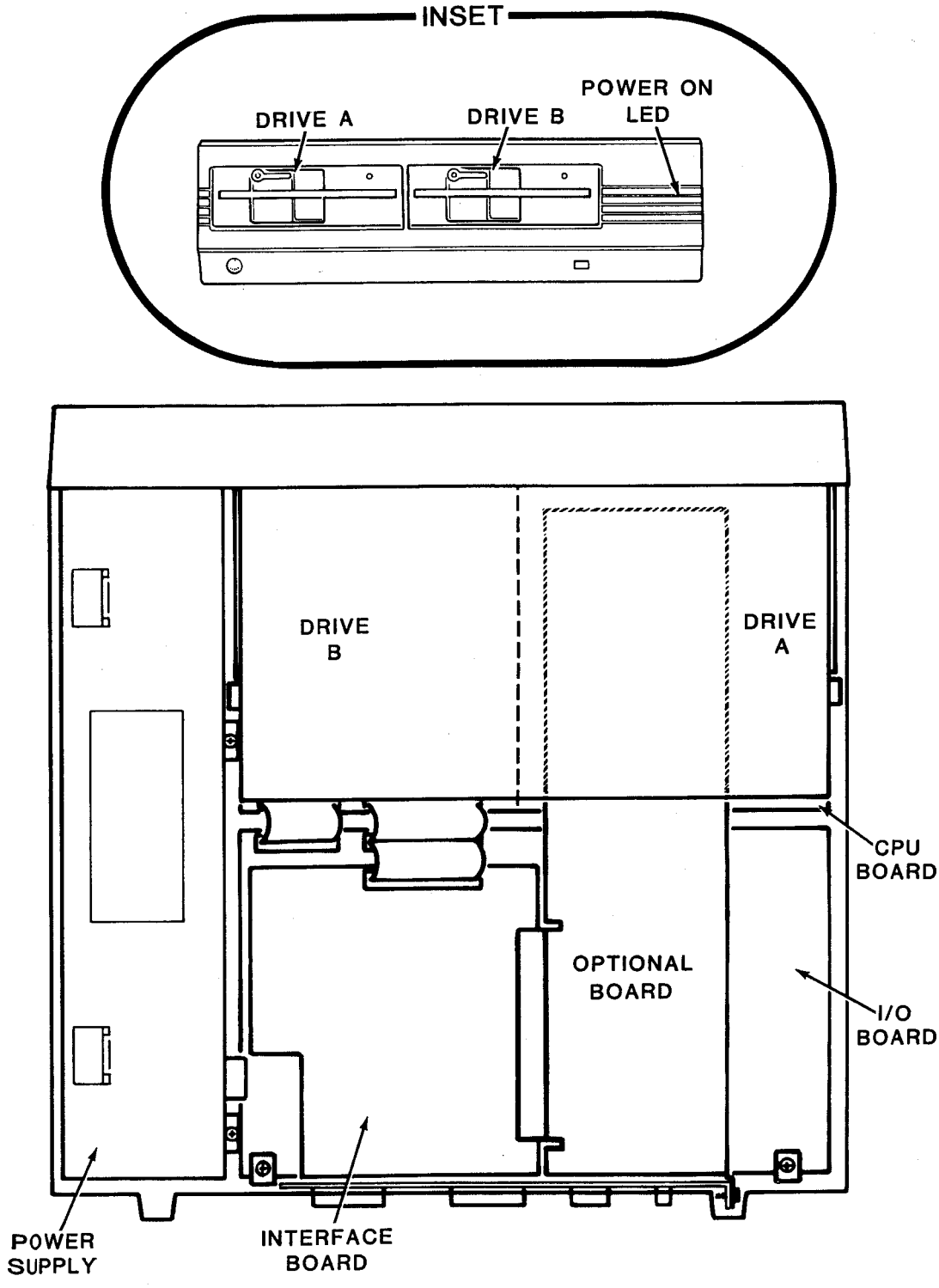


Figure 5-2: Z-140 PC Series Board Locations

CPU Board

Two DIP (dual in-line pin) switch packages are mounted on the CPU board (SW402 and SW403). To gain access to these switches, it may be necessary to remove the disk drive assembly as described in Chapter 4. Each switch package contains ten individual switches. Refer to Figure 5-3 for location of the two DIP switches, SW402 and SW403. Each switch section is identified by the marking on the board as illustrated in the figure. Table 5-1 through 5-6 describe each section.

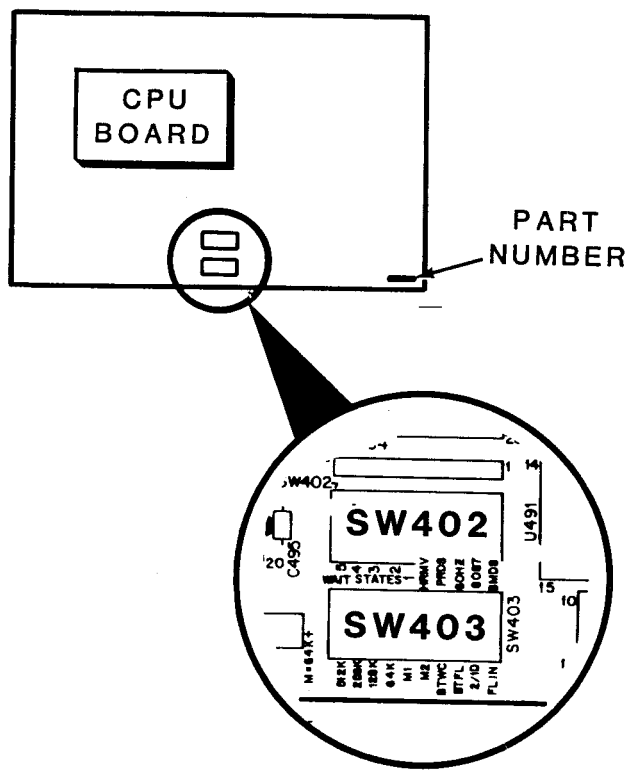


Figure 5-3: Location of DIP Switches SW402 and SW403

Table 5-1: Switch SW402

SECTION	SETTING	DESCRIPTION
8MDS	ON	8-MHz operation is disabled.
	OFF	8-MHz operation may be enabled through the front panel 8 MHz switch. This switch must be off for normal use.
8087	OFF	8087 operation is enabled. The CPU will attempt to use the optional 8087. If the 8087 is not installed, the system will lock up during the self-tests and no message will be displayed on the screen.
	ON	8087 operation disabled. If there is no 8087 installed in the computer, this section must be in the ON position.
60HZ	ON	Normal setting. The video display is refreshed at a 60 Hz rate.
	OFF	Do not use. (The display is refreshed at 50 Hz.)
PRDS	ON	Memory parity checking is disabled. If the memory parity chips are not installed on the CPU board, this switch must be on or an error message will be generated during the self-tests.
	OFF	Memory parity checking is enabled.
HRMV	ON	Initialize the video section of the input/output board upon power up.
	OFF	Initialize the video addresses for a high-resolution monochrome video card, such as the Z-329. If such a card is not installed and the switch is off, nothing will be displayed on the screen of the computer or monitor. Note that the Z-329 can be initialized by executing a VM6 command from the monitor program.
1, 2, 3, 4 and 5		These switch settings control the length of the wait state (measured in clock pulses) when the computer is performing input/output operations. See Table 5-3.

Table 5-2: Wait States — Positions 1, 2, 3, 4, and 5 of Switch SW402

POSITION					
1	2	3	4	5	DESCRIPTION
ON	OFF	OFF	OFF	OFF	One wait state — for 5 MHz-only operation.
OFF	ON	OFF	OFF	OFF	Two wait states.
OFF	OFF	ON	OFF	OFF	Three wait states — for 5 or 8 MHz operation.
OFF	OFF	OFF	ON	OFF	Four wait states.
OFF	OFF	OFF	OFF	ON	Five wait states.

NOTE: Only one switch section position should be on at any time.

Table 5-3: Switch SW403

SECTION	SETTING	DESCRIPTION
FLIN	ON	No floppy disk drives installed; CPU will look for a networking card.
	OFF	Floppy disk drives installed.
2/1D	ON	One floppy disk drive installed as reported by software.
	OFF	Two floppy disk drives installed as reported by software.
BTFL and BTWC		Controls autoboot. See Table 5-4.
M1 and M2		Establish memory devices used in system. See Table 5-5.
64K, 128K, 256K, and 512K		Establish amount of memory installed. See Table 5-6.

Table 5-4: Autoboot Control

BTFL	BTWC	DESCRIPTION
ON	OFF	Autoboot from Winchester or rigid disk system.
ON	ON	Do not use (autoboot from Winchester disk system).
OFF	ON	Autoboot from floppy disk system.
OFF	OFF	Manual boot.

Table 5-5: Type of Memory Devices Used in the Computer

POSITIONS		DEVICE TYPE			MAXIMUM MEMORY
M2	M1	BANK 0	BANK 1	BANK 2	RECOGNIZED
ON	ON	64-kilobit	64-kilobit	64-kilobit	192K
ON	OFF	256-kilobit	64-kilobit	64-kilobit	384K
OFF	ON	256-kilobit	256-kilobit	64-kilobit	576K
OFF	OFF	256-kilobit	256-kilobit	256-kilobit	640K

NOTE: The location of video memory precludes use (recognition) of more than 640K of RAM.

Table 5-6: Amount of Memory Installed

POSITIONS				
64K	128K	256K	512K	AMOUNT OF MEMORY
ON	ON	ON	ON	64K
OFF	ON	ON	ON	128K
ON	OFF	ON	ON	192K
OFF	OFF	ON	ON	256K
ON	ON	OFF	ON	320K
OFF	ON	OFF	ON	384K
ON	OFF	OFF	ON	448K
OFF	OFF	OFF	ON	512K
ON	ON	ON	OFF	576K
OFF	ON	ON	OFF	Maximum (640K usable)

NOTE: The location of video memory precludes use (recognition) of more than 640K of RAM.

Input/Output Board

Jumper Settings

Thirteen different jumper locations are used on this board. Remove the assemblies for the computer being serviced that prevent access to the jumpers. Some jumpers are selected by soldered wires or foils; these locations are not meant to be changed. Refer to Table 5-7 for the purpose of each jumper and Figure 5-4 and Figure 5-5 for location of the jumpers.

Table 5-7: Input/Output Board Jumper Settings

JUMPER	DESCRIPTION
J201	Wired to enable interrupt request 7 (IRQ7) for the parallel port. This interrupt causes the CPU to recognize and service (through a software routine) a request being made by the parallel device.
J202	Enables COM1 or COM2 (the serial port). Either IRQ4 (COM1) or IRQ3 (COM2) can be configured by the placement of this jumper. To select COM1, install a jumper at pins 2 and 3; to select COM2, install a jumper at pins 1 and 2. It is set for COM1 at the factory.
J203	Used to determine the light pen polarity. Not supported by Zenith Data Systems — no jumper block or jumper is installed at the factory. Settings: for positive pulse, install a wire jumper between pins 1 and 2; for negative-going pulse, install a wire jumper between pins 2 and 3.
J204	Used to establish the vertical/composite sync polarity for an external monitor. For positive sync polarity, install a jumper between pins 1 and 2; for a negative sync, install a jumper between pins 2 and 3. Factory setting — positive sync polarity.
J205	Establishes the horizontal sync polarity for an external monitor. For positive sync, install a jumper between pins 1 and 2; for negative sync, install a jumper between pins 2 and 3. Factory setting — positive sync polarity.
J206	Used to select either a vertical-only or a composite (vertical and horizontal) sync signal for the external and internal monitors. A circuit board foil selects the vertical sync signal.

If a composite sync signal is required, install a wire jumper between pin locations 2 and 3 and cut the foil between pin locations 1 and 2. The vertical sync signal is selected by a foil between locations 1 and 2. If the foil has been cut and the vertical sync signal is required, replace the cut foil with a wire jumper between pin locations 1 and 2.

NOTE: Jumper location J206 works in conjunction with the jumpers at J204 and J216. J206 establishes whether the signal will be the vertical-only or composite sync. J204 selects the polarity of the external monitor and J216 selects the polarity of the internal monitor. Individual sync selection for the external and internal monitors cannot be made; they are tied together through this jumper.

J207 Selects the source of the vertical sync signal. For output from gate array U211, install a jumper between pin locations 2 and 3; for output from pin 5 of U259, install a jumper between pin locations 1 and 2. Factory setting — Wired to select the one-shot multivibrator U259, which makes sure that the pulse width of the vertical signal will not be affected when the operating modes are changed. Later releases of the gate array may modify this setting.

J208 No jumper installed; not used in functional units. Its sole purpose is to aid in manufacturing the wired board.

J209 This jumper location enables or disables the light pen strobe signal. It is wired between pin locations 1 and 2 to enable the light pen strobe signal from pin 3 of the CRT controller (U239). To disable the strobe signal, install the jumper between pin locations 2 and 3.

J212 Used to select the horizontal sync signal source. For output from gate array U211, install a jumper between pin locations 1 and 2; for output from from pin 13 of U259, install a jumper between pin locations 2 and 3. The one-shot multivibrator U259 makes sure that the pulse width of the horizontal signal will not be affected when operating modes are changed. Factory setting — wired to select the gate array; later releases of the gate array may modify this selection.

J214	Used to increase the pulse width of the column address strobe (CAS*) signal from pin 19 of the gate array. No jumper is installed, so the falling edge of the CAS* signal occurs when it should, making sure the row address strobe (RAS*) pulses have adequate time to refresh data within the RAM banks. Later releases of the gate array may affect this setting.
J215	Used to select the polarity of the internal monitor's horizontal sync signal. For a positive horizontal sync signal, install a jumper between pins 2 and 3; for a negative sync signal, install a jumper between pins 1 and 2 (marked with a "+" on the board).
J216	Used to select the polarity of the internal monitor's vertical sync signal. For a positive vertical sync signal, install a jumper between pins 1 and 2 (marked with a "+" on the board); for a negative sync signal, install a jumper between pins 2 and 3.

Configuration

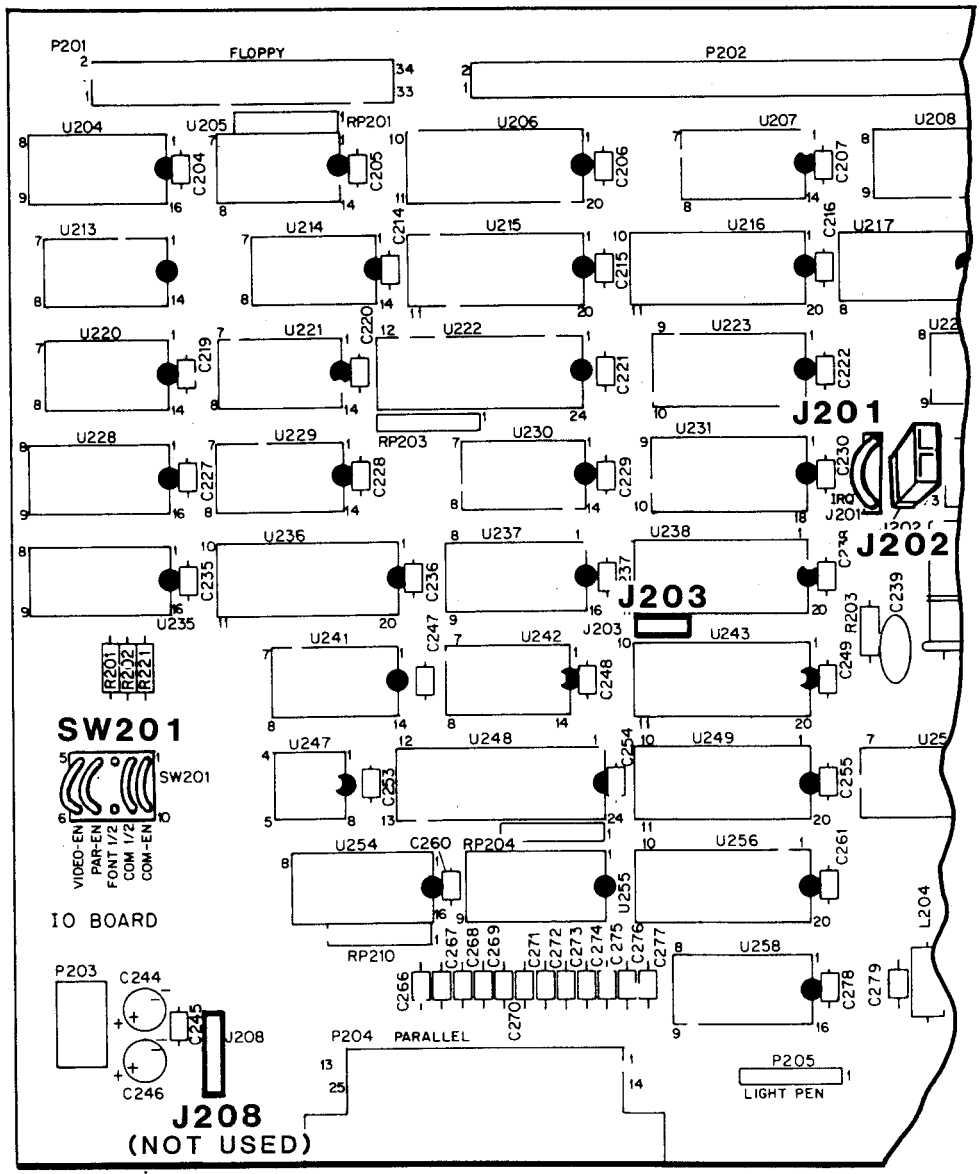


Figure 5-4: Input/Output Board Jumper and Switch SW201 Locations

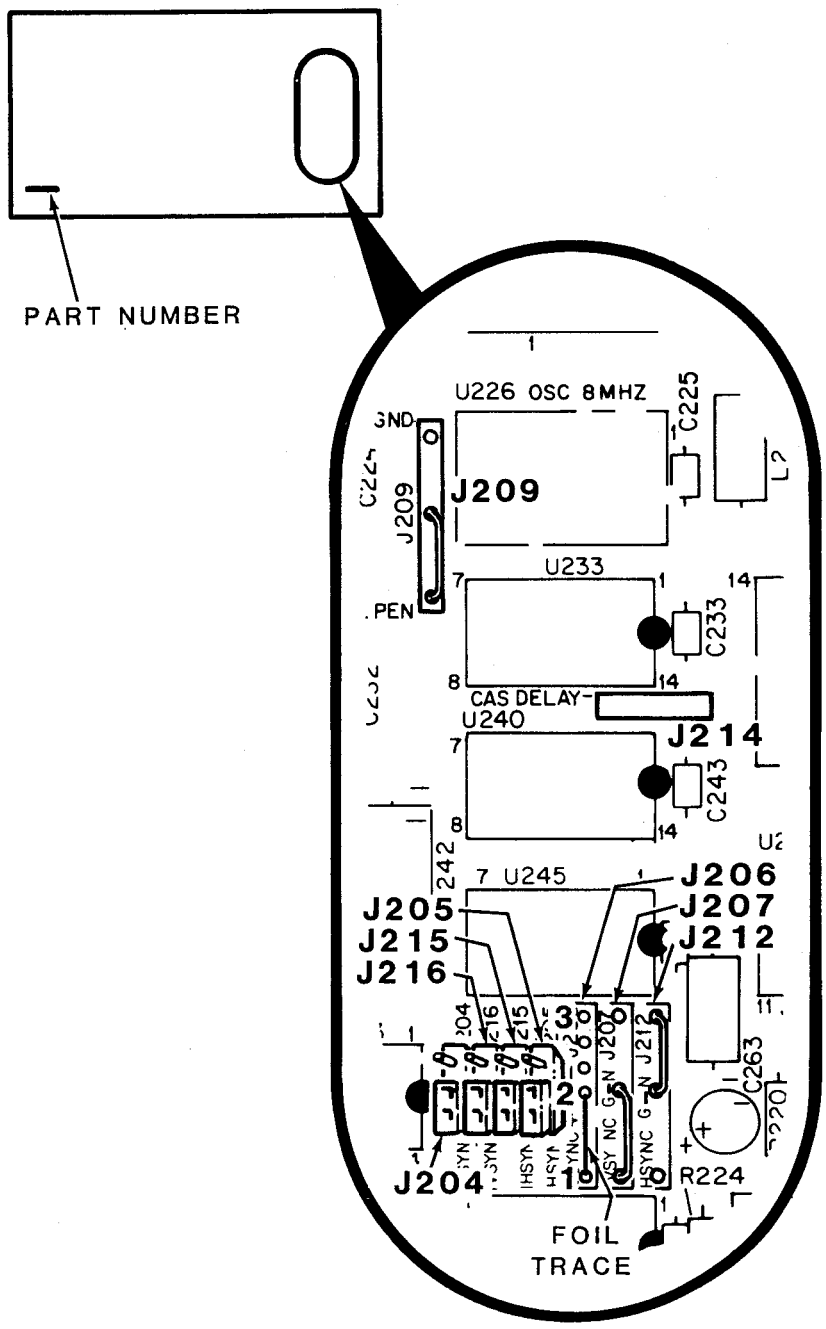


Figure 5-5: Input/Output Board Jumper Locations

Switch SW201

Switch location SW201 is used to enable or disable the floppy disk controller, the serial input/output (I/O) port, and/or the parallel port, or to select an optional character font. Refer to Figure 5-4 for the location of SW201; the positions are marked on the board. Wire jumpers are installed because the settings are seldom modified. An installed jumper is "on." Later versions of these computers may have a DIP switch. Regardless of its orientation, the on position of each section will complete the circuit. Table 5-8 describes each section.

Table 5-8: SW201 Settings

SECTION	DESCRIPTION
COM-EN	Used to enable or disable the serial port. Wired "on" to enable the serial port.
COM 1/2	Selects which serial port will be used by the computer. Wired "on" to select COM1, the normal configuration for these computers.
FONT 1/2	Used to select a custom character font (font 2). No jumper is installed since Zenith Data Systems does not supply any custom character fonts.
PAR-EN	Used to enable or disable the parallel printer port. Wired "on" to select the port.
VIDEO-EN	Used to enable or disable the video circuitry. Wired "on" to enable the circuitry.

Floppy Disk Drive Configuration

Several different manufacturer's half-height floppy disk drives may be used in these computers. The drive type is identified on the back of the computer with a code. Codes 163 and 192 are similar to the Shugart design and codes 168 and 200 are the Mitsubishi designs. The following provides programming information for the half-height floppy disk drives that have been approved.

Mitsubishi Half-Height Floppy Disk Drives

Two slightly different Mitsubishi floppy disk drives can be used; the only difference between the two is the location of the jumpers and type of termination used. Refer to Figure 5-6 and Table 5-9. Remove the termination jumpers or resistor pack on all the drives except for those on the last drive on the cable.

Table 5-9: Mitsubishi Disk Drive Configuration

DRIVE	DS0	DS1	DS2	DS3	MX	HS	HM	HC
A (0)	ON	OFF	OFF	OFF	OFF	OFF	ON	OFF
B (1)	OFF	ON	OFF	OFF	OFF	OFF	ON	OFF
C (2)	OFF	OFF	ON	OFF	OFF	OFF	ON	OFF
D (3)	OFF	OFF	OFF	ON	OFF	OFF	ON	OFF

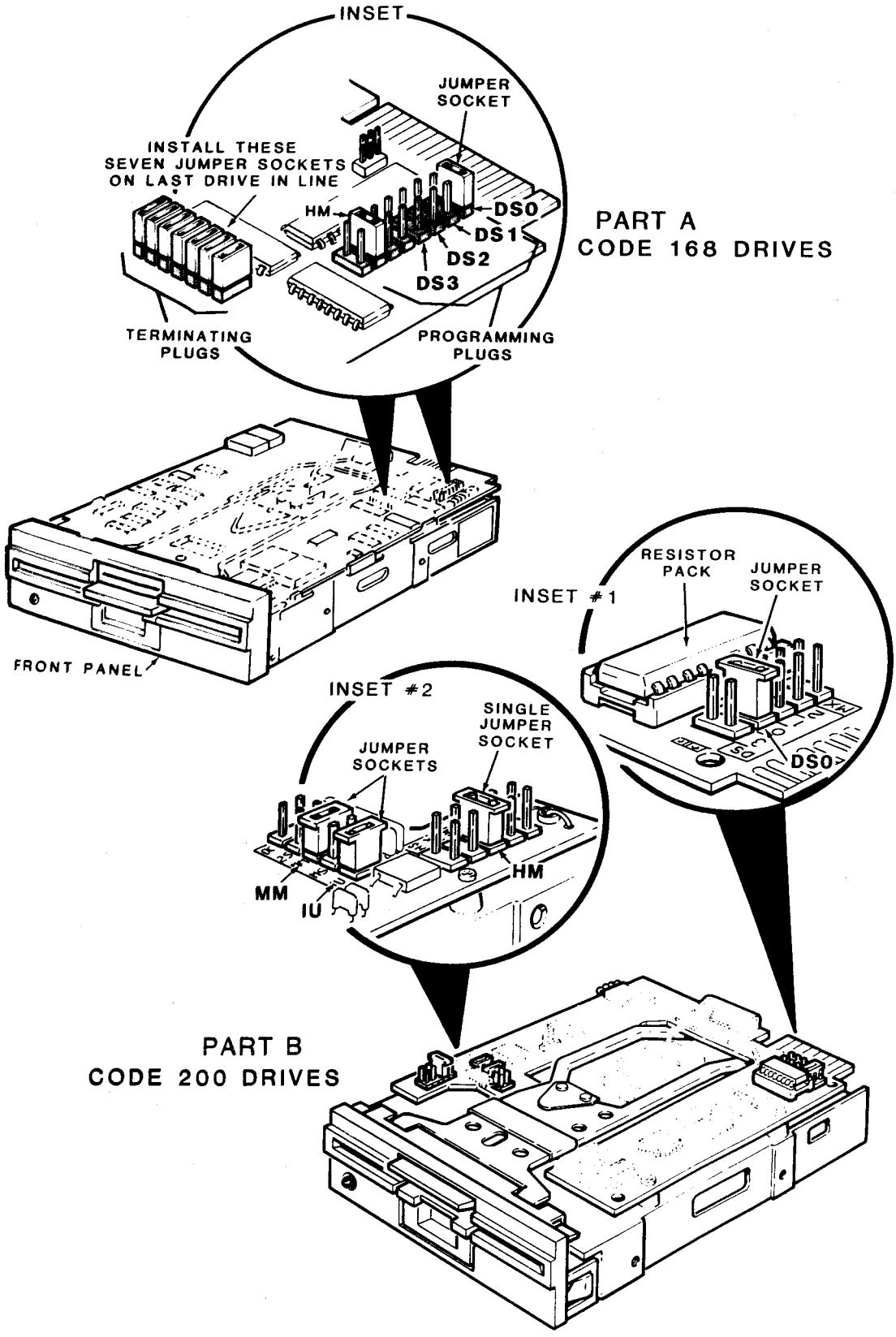


Figure 5-6: Mitsubishi Disk Drive Configuration

Shugart Half-Height Floppy Disk Drives

Refer to Figure 5-7 and Table 5-10 for drive configuration jumper information. Remove the terminating resistor pack on all drives except for the last drive on the cable.

Table 5-10: Shugart Disk Drive Configuration

DRIVE	1	2	3	4	DS-MX
A (0)	ON	OFF	OFF	OFF	Set to DS side of jumper
B (1)	OFF	ON	OFF	OFF	Set to DS side of jumper
C (2)	OFF	OFF	ON	OFF	Set to DS side of jumper
D (3)	OFF	OFF	OFF	ON	Set to DS side of jumper

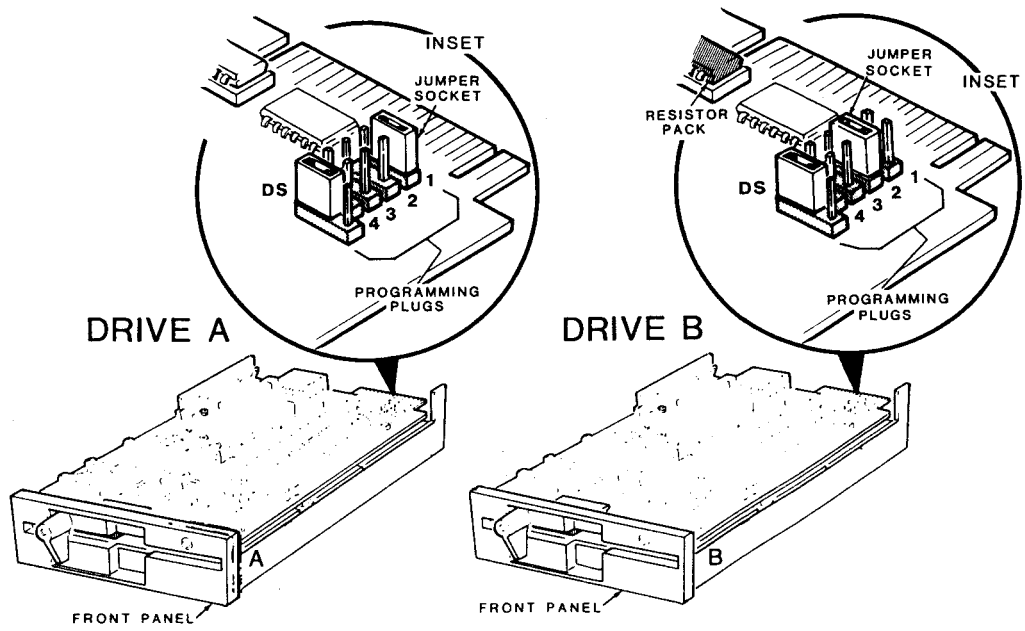


Figure 5-7: Shugart Disk Drive Configuration

Chapter 6

System Checkout and Troubleshooting

This chapter outlines a troubleshooting approach that is intended to isolate a fault to an assembly or module. This procedure can be used to determine that all major sections of a new computer are functioning correctly.

Zenith Data Systems does not support service beyond the assembly or module level. However, detailed circuit descriptions, schematics, and complete parts lists are available in other publications; refer to the list in Chapter 1 of this manual.

Troubleshooting Approach

The system checkout procedure is a systematic approach that verifies the proper operation of each part of the computer. The approach uses the following sequence.

1. Verify general power is to the computer.
2. Verify operation of the power supply.
3. Verify operation of the video logic section of the input/output board.
4. Verify operation of the video interface section of the input/output board.
5. Verify operation of the CPU board.
6. Verify operation of the floppy disk drives.
7. Use ROM-based tests to verify general operation.
8. Use disk-based diagnostics (CB-5063-28) to verify specific operation.

The system checkout procedure forces the technician to check all areas of the computer. Many faults provide a visual indication (video faults, error messages, etc.) of the problem. Experienced technicians may be able to interpret these visual indications without using the whole procedure. Error messages, described in Table 6-1 at the end of this chapter, can isolate defective modules.

CAUTION: Be sure the power switch is OFF, the line cord is removed, and all peripheral equipment is disconnected before disassembling the computer.

System Checkout Procedure

Perform a visual inspection of the following:

- Keyboard cable.
- Monitor cable and monitor power cord.
- Computer power cord.
- Peripheral cables.

If the problem still persists after checking all connections, do the following:

- Disconnect all peripherals from the computer.
- Remove any circuit cards not supplied by Zenith Data Systems.
- Verify that power is available at the power outlet being used by the computer.

NOTE: If no failures are found, you will generally not need to disassemble the computer when using the following procedure. If a problem is discovered, you must disassemble the computer to further troubleshoot and repair the system. Refer to Chapter 4, "Disassembly."

Troubleshooting Procedure

The following procedure is in a question-and-answer form, with a yes or no response provided for most steps.

When the response to the question is "yes," the YES column will direct you to the next step. Likewise, if the answer is "no," the NO column will direct you to the next step. See step 1 for an example.

When a "–" is shown in either or both columns, the fault has been identified and/or corrected, or no action is required. In these cases, the instructions in the step will direct you back to the step that may be used to retest the fault area which has been corrected. See step 1b. for an example.

Step 1: General Power

STEP	PROCEDURE	YES	NO
1.	Turn on the power switch (Figure 6-1 or Figure 6-2). Does the fan start?	2.	1a.
1a.	Is the computer plugged into an operating electrical outlet?	1c.	1b.
1b.	Turn off the computer power switch, plug the computer into an operating power outlet, and return to step 1.	–	–
1c.	Disconnect the plug from the power outlet and use an ohmmeter to check continuity between the two flat blades of the power cord. Is there continuity?	1f.	1d.
1d.	Unplug the power cord from the computer and check for continuity through the cord. Is there continuity?	1f.	1e.
1e.	Replace the power cord and return to step 1.	–	–

STEP	PROCEDURE	YES	NO
1f.	Is the computer a Z-130 PC Series?	1g.	1i.
1g.	Remove the top case of the Z-130 and check the fan power connection. Is the fan plugged into the power supply?	1i.	1h.
1h.	Plug the fan into the power supply. Return to step 1.	–	–
1i.	Replace the power supply (refer to Chapter 4, "Disassembly"). Return to step 1.	–	–

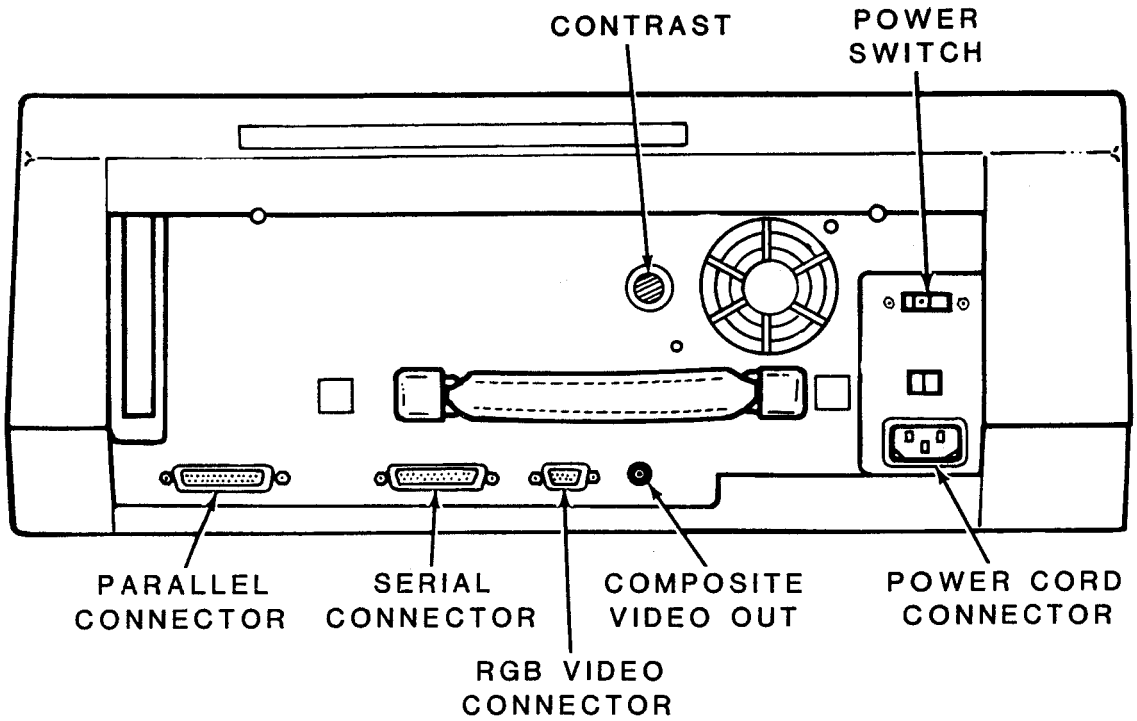


Figure 6-1: Z-130 PC Series Back Panel

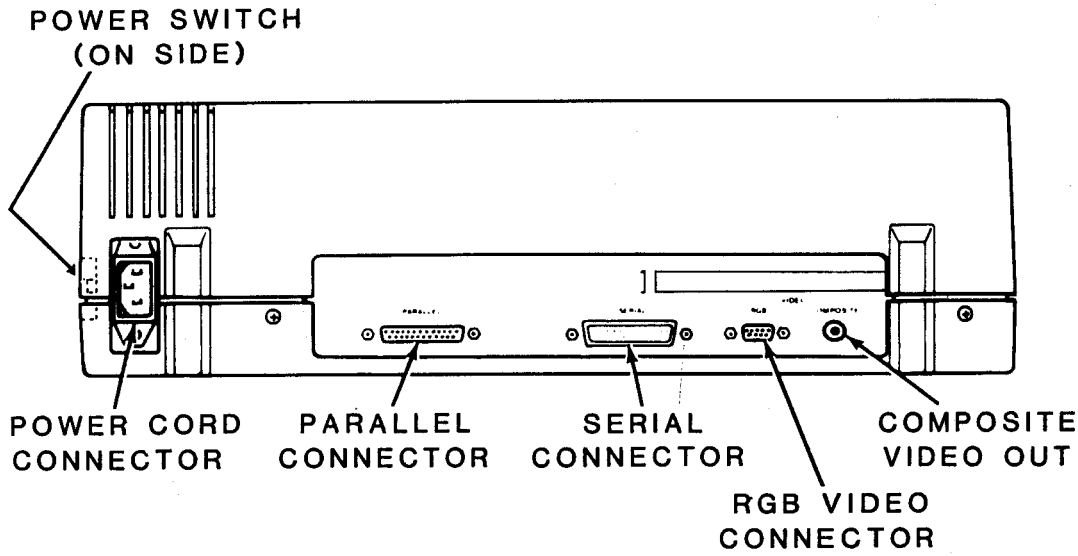


Figure 6-2: Z-140 PC Series Back Panel

Step 2: Power Supply

NOTE: If the computer under test is a Z-130 PC Series, the disk access indicator of drive A (refer to Figure 6-1) can be used in place of the front panel power indicator on the Z-140 PC Series (refer to Figure 6-2) while performing the following.

If the Z-130 PC Series is configured for autoboot (refer to Chapter 5, "Configuration"), the disk access indicator will come on about seven seconds after the power is switched on and remain lit for about 30 seconds.

If the Z-130 PC Series is configured for manual boot, the disk access indicator will light for about two seconds during the power-up self-tests which occurs during the first seven seconds after the computer is turned on. If the Z-130 PC Series does not autoboot, you must watch closely for the disk access indicator to light.

STEP	PROCEDURE	YES	NO
2.	Does the front panel power indicator (Z-140 PC Series) or disk access indicator (Z-130 PC Series) light?	3	2a.
2a.	Remove the top cover (Chapter 4, "Disassembly"). Is the speaker and power indicator cable connected properly (Figure 6-3 or Figure 6-4)?	2c.	2b.
2b.	Turn off the power and connect the cable. Return to step 2.	–	–
2c.	Is the power cable plugged into the CPU board (Figure 6-3 or 6-4)?	2d.	2b.
2d.	Is the power cable plugged into the input/output board (Figure 6-3 or 6-4)?	2e.	2b.
2e.	Is the interconnecting cable fully plugged in (Figure 6-3 or 6-4)?	2f.	2b.
2f.	Is an interface board present in the computer?	2g.	2k.
2g.	Is the power supply cable plugged into the interface board (Figure 6-3 or 6-4)?	2h.	2d.
2h.	Is an optional PC-compatible card present in the computer?	2i.	2k.
2i.	Is the optional PC-compatible card properly seated into the connector on the interface board?	2j.	2b.
2j.	Turn off the power and seat the card into the connector. Return to step 2.	–	–
2k.	Are the power supply cables plugged into the disk drives?	2m.	2l.

STEP	PROCEDURE	YES	NO
2l.	Turn off the power and plug the power supply cables into the disk drives. Return to step 2.	–	–
2m.	To check for an overload state, turn off the computer. Remove any optional PC-compatible card (Chapter 4, "Disassembly"). Turn the power back on. Does the front panel power indicator (Z-140 PC Series) or disk access indicator (Z-130 PC Series) light?	2n.	2o.
2n.	Replace the defective card. Return to step 2.	–	–
2o.	Examine the interface board. Are ROMs installed on the board?	2p.	2r.
2p.	Are the ROM ICs properly seated in their sockets?	2r.	2q.
2q.	Turn off the power. Remove the ROMs and reinstall them. Return to step 2.	–	–
2r.	Turn off the power. Remove the interface board (Chapter 4, "Disassembly"). Make sure the interconnecting cable is fully seated in the CPU board connector and the input/output board connector. Turn the power back on. Does the front panel power indicator (Z-140 PC Series) or disk access indicator (Z-130 PC Series) light?	2s.	2t.
2s.	Replace the interface board. Return to step 2.	–	–

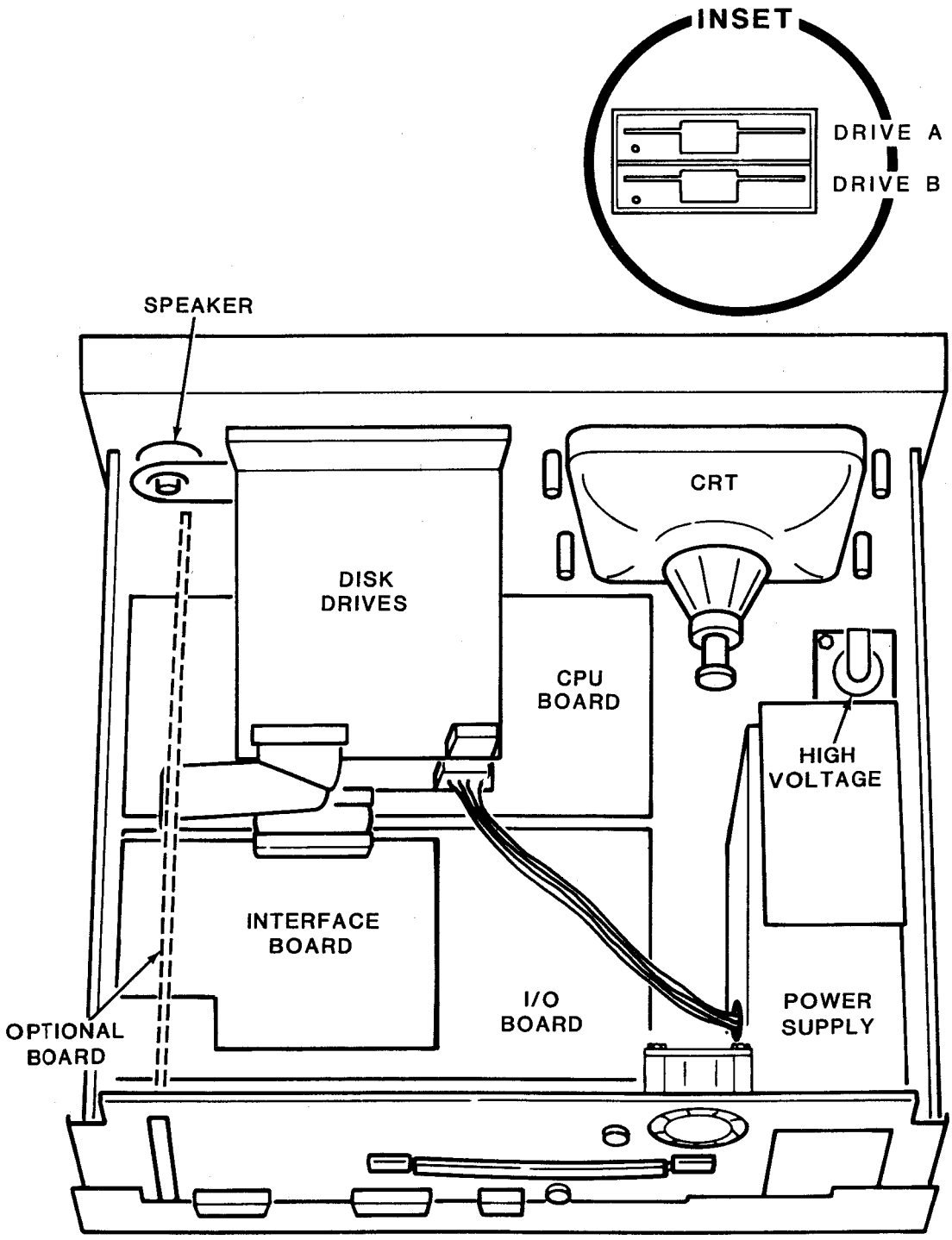


Figure 6-3: Z-130 PC Series Interior

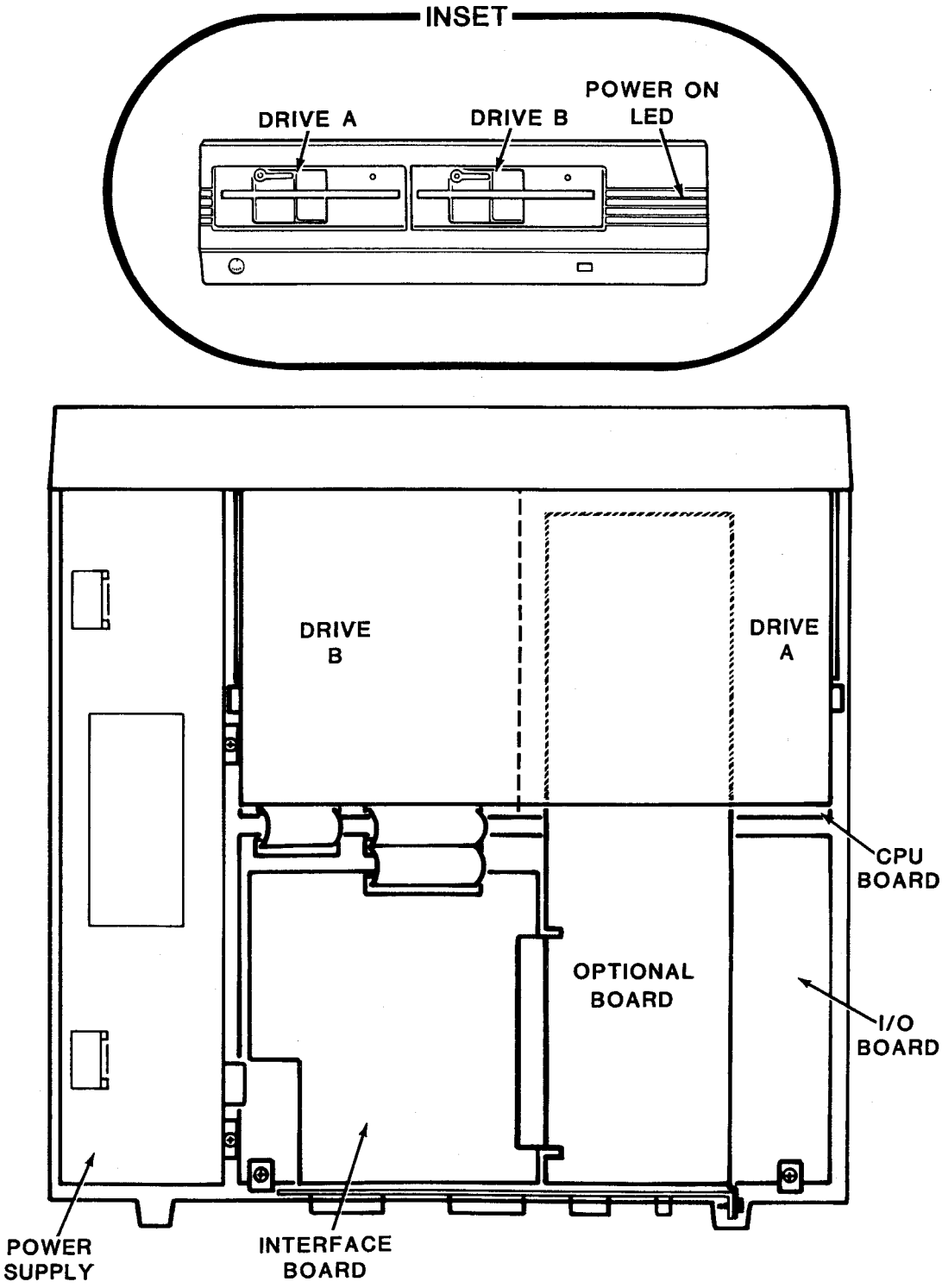


Figure 6-4: Z-140 PC Series Interior

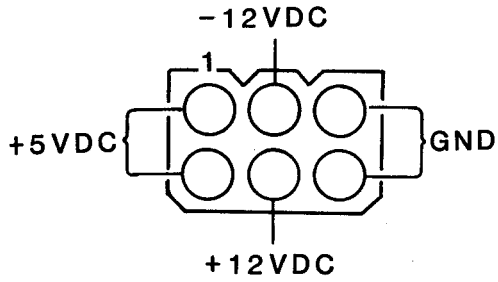


Figure 6-5: Interface Board Connector Voltage Readings

STEP	PROCEDURE	YES	NO
2t.	Disconnect the power supply cable at the interface board. Using a voltmeter, check all the connectors for the voltage readings shown in Figure 6-5. Are these voltages correct?	3.	2u.
2u.	Replace the power supply (Chapter 4, "Disassembly"). Return to step 2.	–	–

Step 3: Video Logic

The purpose of this step is to verify that there is an output from the video logic portion of the input/output board. The actual output (display) may not be correct at this point.

STEP	PROCEDURE	YES	NO
3.	Is anything (including an unreadable display) shown on the video monitor?	4	3a.
3a.	Are all video cables installed properly and is the monitor connected to power and turned on?	3c.	3b.
3b.	Connect the cable and/or turn on the monitor. Return to step 3.	–	–

STEP	PROCEDURE	YES	NO
3c.	Is the black level or brightness control on the monitor turned down (Z-130 PC Series: the control is located on the back panel for the built-in display)?	3d.	3e.
3d.	Increase the brightness. Return to step 3.	–	–
3e.	Is the computer a Z-130 PC Series?	3f.	3g.
3f.	Are you using an external monitor?	3g.	3j
3g.	Does the monitor and cable work on a computer that is known to be good?	3i.	3h.
3h.	Return the monitor to the shop. Refer to the appropriate service manual to repair the monitor. When the monitor is repaired or a functional monitor is obtained, return to step 3.	–	–
3i.	Replace the input/output board. Return to step 3.	–	–
3j.	Use an external monitor and cable that is known to be good to test the output of the input/output board. Does the monitor and cable work on the computer under test?	3k.	3i.
3k.	Remove the top cover and observe the filaments of the CRT. Are any of them glowing?	3l.	3m.
3l.	Replace the video deflection board. Return to step 3.	–	–
3m.	Replace the high voltage assembly. Return to step 3.	–	–

Step 4: Video Interface

STEP	PROCEDURE	YES	NO
4.	Is the message `+++ DISK ERROR: Drive not ready+++` correctly displayed in the upper left-hand corner of the screen?	5.	4.a.
4a.	Is the computer connected to a Winchester system?	4b.	4c.
4b.	Turn off the computer. Wait five seconds. While holding down the ESC key, turn on the computer. Continue to hold the ESC key down for seven seconds after you turn on the computer. Enter **BF** and press the **RETURN** key. Wait for 30 seconds and then proceed to step 4c.	–	–
4c.	Is the message `+++ DISK ERROR: Drive not ready+++` correctly displayed in the upper left-hand corner of the screen?	5.	4d.
4d.	Is a different error message correctly displayed?	4x.	4e.
4e.	Is the disk error message displayed correctly, but in the right-hand corner of the screen?	4f.	4g.
4f.	The wrong monitor connecting cable is being used (refer to the monitor manual for the correct cable part number). Replace the cable. Return to step 4.	–	–
4g.	Has this computer worked before?	4m.	4h.
4h.	Adjust the video monitor gain as described in the monitor manual. Does this correct the display?	4.	4i.
4i.	Is the display curved, fragmented, and/or rolling?	4j.	4k.

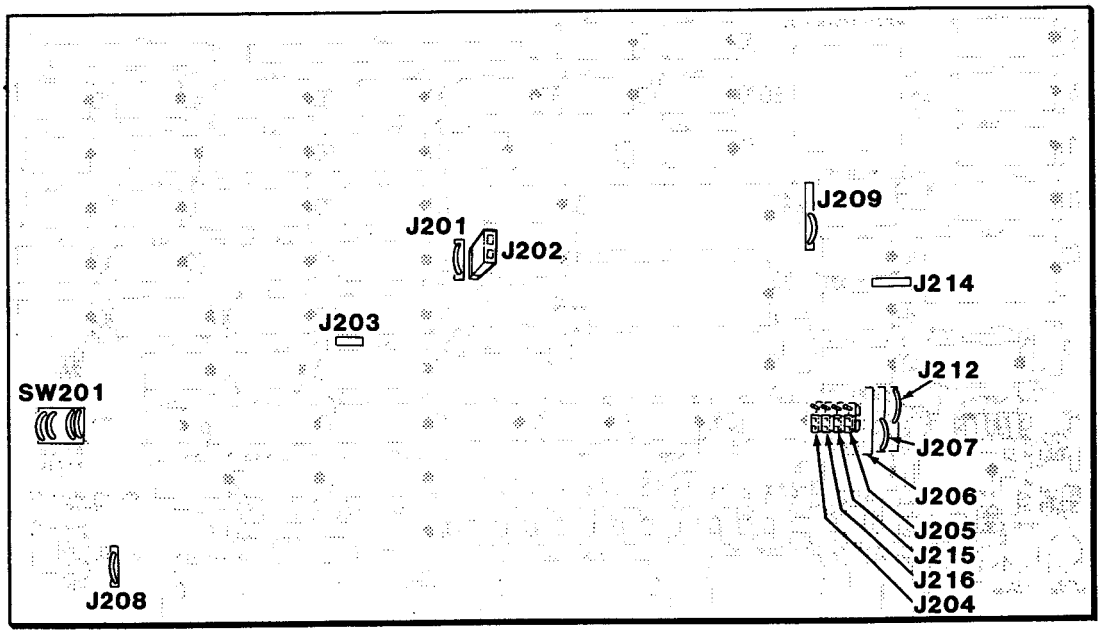


Figure 6-6: Input/Output Board Jumpers

STEP	PROCEDURE	YES	NO
4j.	Turn off the computer. Remove the top cover (refer to Chapter 4, "Disassembly") and access the input/output board jumpers. Move jumpers J204 and J205 on the input/output board (refer to Figure 6-6) to the opposite position. Reassemble the computer and turn on the power. Is a readable message displayed on the monitor?	4.	4k.
4k.	Is the display rolling?	4l.	4m.
4l.	Turn off the computer and access the input/output board jumpers. Move jumpers J204 and J205 to the opposite position. Reassemble the computer and turn on the power. Is a readable message displayed on the monitor?	4.	4m.

System Checkout and Troubleshooting

STEP	PROCEDURE	YES	NO
4m.	Turn off the computer and replace the input/output board. Does the display change?	4.	4n.
4n.	Is the computer a Z-130 PC Series computer?	4o.	4q.
4o.	Are you using an external monitor?	4p.	4s.
4p.	Does the monitor and cable work on a computer that is known to be good?	4r.	4q.
4q.	Return the monitor to the shop. Refer to the appropriate service manual to repair the monitor. When the monitor is repaired or a functional monitor is obtained, return to step 4.	–	–
4r.	Replace the input/output board. Return to step 4.	–	–
4s.	Use an external monitor and cable that is known to be good to test the output of the input/output board. Does the monitor and cable work on the computer under test?	4t.	4r.
4t.	Remove the top cover and observe the filaments of the CRT. Are any of them glowing?	4u.	4v.
4u.	Replace the video deflection board. Return to step 4.	–	–
4v.	Replace the high voltage assembly. Are the filaments glowing now?	4.	4w.
4w.	Replace the CRT. Return to step 4.	–	–
4x.	Is a Winchester installed?	8.	9.

Step 5: CPU Board

STEP	PROCEDURE	YES	NO

5.	Press the **CTRL**, **ALT**, and **INS** keys at the same time. Is the monitor displaying a monitor prompt similar to the following?
	
	`MFM-140 Monitor, Version x.x`
	`Memory Size: xxxK bytes`
	`Enter "?" for help.`
	`>_`
		6.	5a.

5a.	Replace the keyboard and retry step 5. Is the display correct?	5c.	5b.
5b.	Turn off the power and replace the CPU board. Return to step 5.	–	–

Step 6: Disk Drives

STEP	PROCEDURE	YES	NO

6.	Place MS-DOS Distribution Disk I into drive A (refer to Figure 6-7 or Figure 6-8). Press the **B** key and then the **RETURN** key to boot the disk. After the disk has booted, does an enter date message similar to the following appear?
	
	`A>DATE`
	`Current date is Tue 1-01-1980`
	`Enter new date:_`
		6a.	6c.

6a.	Does the computer have a second disk drive?	6b.	7.
6b.	Move the disk in drive A to drive B. Press the **CTRL**, **ALT**, and **INS** keys at the same time. Then enter **B1** and press the **RETURN** key to boot the disk from drive B. Is the enter date message displayed?	7.	6c.

STEP	PROCEDURE	YES	NO
6c.	Turn off the computer and remove the top cover. Inspect the disk drives. Are the drive cables properly installed?	6d.	6e.
6d.	Replace the disk drive. Return to step 6.	–	–
6e.	Properly install the disk drive cables. Return to step 6.	–	–

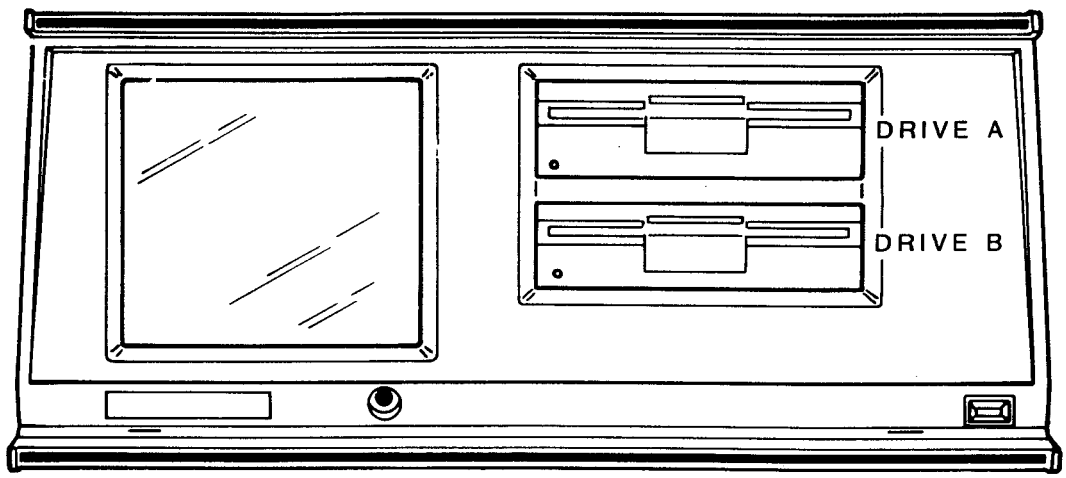


Figure 6-7: Z-130 PC Series Disk Drives

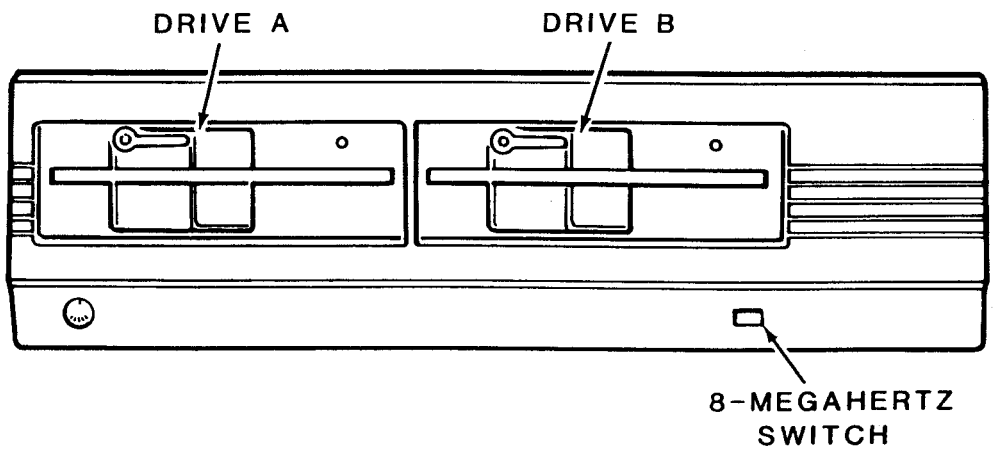


Figure 6-8: Z-140 PC Series Disk Drives

Step 7: ROM-Based Tests

STEP	PROCEDURE	YES	NO
7.	Press the **CTRL**, **ALT**, and **INS** keys at the same time. When the monitor prompt appears, enter **TEST** and press the **RETURN** key. You should see the following menu. CHOOSE ONE OF THE FOLLOWING 1. DISK READ ERROR 2. KEYBOARD TEST 3. MEMORY TEST 4. POWER-UP TEST 5. EXIT ENTER YOUR CHOICE Press the **1** key. Does the following message appear on the screen? DEVICE ERROR	9.	7a.
7a.	Press the **ESC** key twice. Press the **2** key. Do not press the ESC key, but press every other key on the keyboard. Is the correct character, symbol, or message displayed, as shown in Table 6-2?	7c.	7b.
7b.	Turn off the computer and replace the keyboard. Return to step 7.	–	–
7c.	Press the **ESC** key. Press the **3** key. Does the computer beep or sound a click at a regular interval?	7e.	7d.

STEP	PROCEDURE	YES	NO
7d.	Turn off the computer, check that all cables are properly connected. If all the cables are properly connected, replace the CPU board. Turn the computer back on and return to step 7.	–	–
7e.	Wait until the message TEST COUNT = 2 or an error message is displayed. Is an error message displayed?	7d.	7f.
7f.	Press the **ESC** key twice. Note that the computer may not quickly respond to pressing the ESC key. It may be necessary to press the ESC key more than twice to return to the ROM-based test menu. Do you have two disk drives?	7g.	7i.
7g.	Place MS-DOS Distribution Disk I into drive A (it may still be in drive B). Press the **5** key. Enter **B0** and press the **RETURN** key to boot the system. After the system has booted, press the **CTRL**, **ALT**, and **INS** keys at the same time. Enter **TEST** and press the **RETURN** key. Press the **1** key. Does the message DEVICE ERROR occur?	7h.	7i.
7h.	Remove the disk and replace drive A. Return to step 7.	–	–
7i.	Is a Winchester disk system attached to the system?	7j.	7k.
7j.	Press the **ESC** key twice. Press the **5** key. Proceed to step 8.	–	–

STEP	PROCEDURE	YES	NO
7k.	The ROM-based diagnostics have detected no failures. Press the **ESC** key twice. Press the **5** key. If no problem is suspected, run the disk-based diagnostics (CB-5063-28). Refer to the disk-based diagnostics manual for instructions.	–	–

Step 8: Winchester System

STEP	PROCEDURE	YES	NO
8.	If a Winchester system is attached to or installed in the computer, boot the Winchester (or allow it to autoboot), then press the **CTRL**, **ALT**, and **INS** keys at the same time. Enter **TEST** and press the **RETURN** key. Allow test 1 (DISK READ TEST) to run for at least 30 seconds. Is the message DEVICE ERROR displayed on the screen?	8a	8c.
8a.	Turn off the computer (and expansion chassis, if the Winchester system is located in it). Replace the Winchester controller card. Return to step 8.	–	–
8b.	Replace the Winchester disk drive. Return to step 8.	–	–
8c.	Is some other error message displayed?	9.	8d.
8d.	The test described in the step only checks that the system can read the Winchester disk drive. For a complete test of the rigid disk system, refer to and run the disk-based diagnostics. Does the system pass the disk-based diagnostic tests for rigid disk drives?	8g.	8e.
8e.	Turn off the power and replace the rigid disk system controller card. Retry the disk-based rigid disk drive tests. Does the system pass?	8g.	8f.

STEP	PROCEDURE	YES	NO
8f.	Replace the rigid disk drive (and/or cartridge). Return to step 8.	–	–
8g.	The preceding steps may not have detected all faults. If a problem is still suspected, run the disk-based diagnostic tests. Refer to the disk-based diagnostics manual for instructions.	–	–

Step 9: Error Messages

STEP	PROCEDURE	YES	NO
9.	The system has detected a fault and displayed an error message. Refer to Table 6-1 for the error message and the corrective action required to correct the fault.	–	–

Table 6-1: Error Messages

```
+++ ERROR: CPU failure! +++
+++ ERROR: ROM checksum failure! +++
```

When either of these messages occur, the CPU board has a fault. Replace the CPU board. Return to step 5.

```
+++ ERROR: RAM failure! Address:XXXX:YYYY, Bit: n, Chip UXXX +++
+++ ERROR: Parity hardware failure! Address:XXXX:YYYY, Chip UXXX +++
+++ ERROR: Parity failure! Address: XXXX:YYYY, Chip: UXXX +++
```

These messages indicate that the CPU is unable to read from or write to RAM or video memory. Refer to Chapter 5 and check to make sure that the CPU DIP switches are correctly set for the amount of memory installed in the computer.

If the chip number displayed is a 400 number, the failure is on the CPU board. If the chip number is a 300 number, the failure is on the input/output board. Replace the IC indicated in the message. Return to step 7.

Table 6-1 (continued): Error Messages

+++ ERROR: Timer Interrupt failure! +++

This error indicates the possible failure of interrupt control and/or timer logic on the CPU board. Refer to Chapter 5 and make sure the configuration switches and jumpers are correctly set for the options that may be connected to the computer. Also check that all optional boards are set up properly. If that does not correct the problem, replace the CPU board. Return to step 5.

+++ ERROR: Invalid/No keyboard code received! +++

Normally this message is caused by the keyboard being unplugged. If the keyboard is plugged in, the problem may be in the keyboard or keyboard cable. Replace the keyboard and/or keyboard cable. Return to step 2.

+++DISK ERROR: Drive not ready! +++

These errors are usually caused when the system attempts to boot the operating system from the disk and no disk is in the disk drive. This may also be caused by a faulty disk or floppy disk controller circuit on the input/output board. Make sure there is a disk in the drive, that it is inserted correctly, and that the drive latch is closed. If a disk is properly inserted in the drive, try another disk or try booting from the other disk drive. Return to step 7.

No system

This message occurs when a disk does not contain an operating system. Check that the disk is inserted properly and that it contains a valid operating system.

+++ DISK ERROR: Bad disk controller! +++
+++ DISK ERROR: DMA overrun error! +++

These errors usually indicate a faulty input/output board, but may be caused by addressing clashes with boards that are not supplied by Zenith Data Systems. Turn off the computer, disconnect the expansion chassis or remove any optional boards that are installed, and return to the step where this message first appeared.

+++ DISK ERROR: Sector not found! +++
+++ ERROR: CRC error! +++
+++ DISK ERROR: Invalid address mark detected! +++

These errors happen when booting the operating system from disk. They can be the result of using a damaged disk, one that does not have the operating system on it, or from a faulty disk drive. You can usually correct this condition by using another disk. If this problem continues, try booting from the other disk drive.

Table 6-1 (continued): Error Messages

`+++ DISK ERROR: Seek failure! +++`

This error indicates that the computer cannot read the disk and/or cannot read track 0. This error can be caused by a damaged disk or by the failure of the input/output board. Replace the disk or try the other disk drive. If the problem still persists, replace the input/output board and return to step 6.

`DEVICE ERROR`

This message occurs only during the disk read test of the ROM-based tests. When it occurs, it indicates that the computer is unable to read the disk. Check to make sure that a disk is correctly installed in the drive and that the drive is closed. If a disk is installed properly, this message indicates the failure of either the disk drive or the input/output board. Try the same disk in the other disk drive. If the problem persists, replace the input/output board and return to step 6.

Table 6-2: Keyboard Test Results

KEY PRESSED	CORRECT DISPLAY
CTRL SHIFT	These keys modify the results produced by the other keys, but do not produce any code or character.
ALT	This key modifies the results produced by the other keys. However, the results of pressing a key and the ALT key at the same time will not be seen until the ALT key is released.
SCROLL LCK	This key produces no effect.
NUM LCK	This key has no effect of its own, but it does modify the function of the calculator keypad. With the NUM LCK indicator lit, the number on the keypad keys pressed will fill the screen. With the NUM LCK indicator out (off), only the key code of the key will be displayed.
CAPS LOCK	This key has no effect of its own, but it does modify the the alphabetic keys. With the CAPS LOCK indicator lit, the alphabetic keys will produce uppercase letters. With the CAPS LOCK indicator out (off), the alphabetic keys will produce lowercase letters.
ESC	Pressing this key will return control to the menu.

Table 6-2 (continued): Keyboard Test Results

KEY PRESSED	CORRECT DISPLAY
All other keys	The key code of the pressed key will be displayed. If the key pressed is displayable, such as an alphanumeric key, the screen will be filled with that character. Note that the SHIFT, ALT, and CTRL keys modify the key codes generated by the key being pressed. The owner's manual has a complete list of key codes.

Chapter 7
Parts Lists

The parts lists in the following tables provide information on the major assemblies that are considered to be field-replaceable. Use Table 7-1 for the Z-130 PC Series and Table 7-2 for the Z-140 PC Series. For complete parts lists of all parts, along with exploded views and schematics, refer to the Schematics and Parts Lists package for the appropriate computer.

Table 7-1: Z-130 PC Series

PART NUMBER	DESCRIPTION
HE-89-65	Line cord
HE-92-857	Front panel
HE-92-858	Top cover
HE-92-859	Bottom (chassis)
HE-92-863	Door
HE-92-864	Access panel
HE-92-865	Blank disk drive panel
HE-92-866	Rear panel
HE-92-868	Fan cover
HE-92-869	Access panel
HE-203-2288-1	Back panel
HE-150-163	Shugart half-height disk drive (code 163)
HE-150-168	Mitsubishi half-height disk drive (code 168)
HE-150-192	Matsushita half-height disk drive (similar to Shugart) (code 192)
HE-150-200	Mitsubishi half-height disk drive (code 192)
HE-134-1546	Interconnecting cable (CPU to input/output board)
HE-134-1563	Interconnecting cable (CPU to input/output to interface board)
HE-134-1603	Floppy disk drive ribbon cable
HE-181-5608	Input/output board (assembled and tested)
HE-181-5735	CPU board (assembled and tested) with 128K RAM
HE-181-5751	CPU board (assembled and tested) with 256K RAM
HE-163-24	Keyboard (complete assembly)

Table 7-1 (continued): Z-130 PC Series

PART NUMBER	DESCRIPTION
HE-234-766	7″ amber CRT/high voltage assembly/deflection board (complete assembly)
HE-234-739	Power supply
HE-420-656	Fan

Table 7-2: Z-140 PC Series

PART NUMBER	DESCRIPTION
HE-89-65	Line cord
HE-92-851	Top cover
HE-92-850	Bottom (chassis)
HE-203-2270	Blank disk drive panel
HE-203-2264-1	Back panel
HE-150-163	Shugart half-height disk drive (code 163)
HE-150-168	Mitsubishi half-height disk drive (code 168)
HE-150-192	Matshushita half-height disk drive (similar to Shugart) (code 192)
HE-150-200	Mitsubishi half-height disk drive (code 200)
HE-134-1546	Interconnecting cable (CPU to input/output board)
HE-134-1563	Interconnecting cable (CPU to input/output to interface board)
HE-134-1246	Floppy disk drive ribbon cable
HE-134-1605	Keyboard cable
HE-134-1592	Speaker/cable assembly
HE-181-5608	Input/output board (assembled and tested)
HE-181-5735	CPU board (assembled and tested) with 128K RAM
HE-181-5751	CPU board (assembled and tested) with 256K RAM
HE-163-16	Keyboard (complete assembly)
HE-234-671	Power supply

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IMPORTANT NOTICE

The service manual set for the Z-140 PC Series computers consists of the following documents. This notice sets forth the concepts behind these manuals and illustrates their possible use.

Owner's Manual:	Part Number 595-3393
Service Guide:	Model 860-131
Diagnostics:	Model CB-5063-28
Technical Manual:	Model TM-140
Schematics/Parts Lists:	Model 860-124

The service documentation for the Z-140 PC Series computers may be organized into the following sets:

Place the Service Guide in the binder that comes with CB-5063-28. It is possible to place more than one service guide in this same binder. Currently, three are planned: Z-150 PC Series and Z-160 PC Series including two- and three-board designs; Z-130 PC Series and Z-140 PC Series; and the Z-170 PC Series. The CB-5063-28 disk-based diagnostics will work with all five computer series.

> The **service guide** is designed to be used for troubleshooting the computer to the module or board level in a step-by-step fashion. When combined and used with the **diagnostics package**, it serves as a complete field guide in one manual. The service guide also covers the Z-130 PC Series computers.

Place the various owner's manuals in the same binder you use for the technical manuals.

> The **owner's manual** information is provided for reference when discussing customer problems. For field use, most of the critical system installation information is duplicated in the service guide.
>
> The **technical manual** provides the theory of operation and detailed circuit descriptions for both the Z-130 PC Series and Z-140 PC Series. This document provides the technical support for the major circuits in the computers and identifies each function. It is not a service publication, but can help the qualified technician to understand how the computer works.

Place the schematics and parts list in the same binder you use for those of other computers.

> The **schematics and parts lists** is a complete, full-sized set of schematics, exploded views, and parts lists for the Z-140 PC Series computers.